

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
ABANDONED HARDROCK MINE PRIORITY SITES

1995

SUPPLEMENTAL SUMMARY REPORT



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ABANDONED MINE RECLAMATION BUREAU**

**ABANDONED HARDROCK MINE PRIORITY SITES
1995
SUPPLEMENTAL SUMMARY REPORT**

Prepared For:

**Montana Department of Environmental Quality
Abandoned Mine Reclamation Bureau
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Engineering Services Agreement DEQ-AMRB No. 94-006

JUNE 1996

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1.0 INTRODUCTION

This document supplements the 1993 and 1994 Hazardous Materials Inventory Summary Report published by the Montana Department of Environmental Quality (formerly known as the Montana Department of State Lands)/Abandoned Mine Reclamation Bureau (MDEQ/AMRB). The Hazardous Materials Inventory was implemented to consistently characterize and rank the extent of environmental problems associated with the Abandoned Hardrock Mine Priority Sites. This 1995 supplemental report includes an additional 25 sites to the 332 sites inventoried in 1993 and 1994.

This report is organized into six sections. Section 1.0 presents the introduction, project objectives, a brief description of the project tasks, and a summary of the findings. Section 2.0 briefly describes field methods used during the inventory. Section 3.0 discusses data evaluation techniques and data management for the project. Section 4.0 presents a brief description of the Abandoned and Inactive Mines Scoring System (AIMSS) which was developed to rank the priority sites. Section 5.0 presents one page summaries for each of the priority sites. The summaries typically provide details about each site, such as volumes of wastes, contaminant concentrations, observed releases to surface water and groundwater, water quality criteria exceedances, and potential safety hazards. Section 6.0 presents the references cited in the text.

This Summary Report is supported by several other project documents and databases, including:

- The Sampling and Analysis Plan (SAP) presents the sampling approach for the Abandoned Mines Hazardous Materials Inventory. The SAP also contains instructions on completing the Inventory Form and the Standard Operating Procedures (SOPs) for conducting the field sampling activities (MDEQ/AMRB-Pioneer, 1994a).
- The Quality Assurance Project Plan (QAPJP) describes quality assurance procedures used for evaluating the field and lab data for the project (MDEQ/AMRB-Pioneer, 1994b).
- The Laboratory Analytical Protocol (LAP) describes laboratory requirements for the project (MDEQ/AMRB-Pioneer, 1994c).
- The Health and Safety Plan (HSP) describes practices and procedures to be followed by field investigators who performed the project to minimize exposure to hazardous materials and to eliminate any possibility of physical injury (MDEQ/AMRB-Pioneer, 1994d).

- The Abandoned Hardrock Mines Project Report is a compilation of the reports listed above, as well as this Summary Report, the AIMSS Report, the Data Validation/Evaluation Report, and the completed Hazardous Materials Inventory Forms for each site (MDEQ/AMRB-Pioneer, 1994e).
- The Abandoned Hardrock Mine Priority Sites, Hazardous Materials Inventory Databases.

The complete Abandoned Hardrock Mines Project Report, including the 1993 and 1994 inventories, can be viewed in Helena, Montana, at the Montana State Library; the MDEQ/AMRB office; or the MDEQ/Environmental Remediation Division (ERD; formerly known as the Montana Department of Health and Environmental Sciences/Solid and Hazardous Waste Bureau) office or in Missoula, Montana, at the United States Department of Agriculture/Forest Service (USFS), Region 1 office.

1.1 PROJECT OBJECTIVES

There are an estimated 6,000 abandoned or inactive hardrock mine and milling sites in Montana. This legacy of Montana's mining past has left a wide range of problems and challenges for the MDEQ/AMRB and other state and federal agencies charged with the reclamation and mitigation of these problems.

The problems associated with the abandoned and inactive hardrock mine sites are varied and range from safety hazards caused by hazardous mine openings, dangerous highwalls, and dilapidated structures, to threats to human and non-human life and the environment by mining waste containing elevated levels of heavy metals and other contaminants. To date, the MDEQ/AMRB has conducted a great deal of work to eliminate the problems of unsafe openings, highwalls, and structures, and has made over 1,500 of these sites safer.

In 1991, the MDEQ/AMRB concluded that substantial progress had been made in eliminating imminent hazards to public health and safety at abandoned hardrock mine sites. However, limited progress was realized with regard to the problems relating to heavy metal and mineral processing reagent contamination of surface water and groundwater. Not only were some of these sites causing severe environmental degradation, but they were also the sites of highest concern to the public. Additionally, the MDEQ/AMRB recognized that there were a number of other state and federal programs that had resources available to address their problems, but there was no coordinated approach to determining which specific sites should be addressed first. As a result, the MDEQ/AMRB solicited various state and federal agencies, requesting assistance in the identification of suspected problem sites. The following agencies responded to the MDEQ/AMRB request: USFS-Region 1, the United States Department of the Interior/Bureau of Land Management (BLM), MDEQ/ERD, and the

Montana Department of Natural Resources and Conservation (DNRC). A list of the 332 suspect sites was compiled from the input of these agencies supplemented by a review of existing data from the MDEQ/AMRB master inventory. This list included the majority of the highest potential hazard sites in Montana. These sites were investigated and inventoried during the 1993 and 1994 field seasons. As result of the 1993 and 1994 inventory activities and continued records searches, 25 additional sites were identified, investigated, and ranked during the 1995 field season by the MDEQ/AMRB. This 25-site supplement to the 1993 and 1994 priority sites list is presented in Table 1-1. The agencies previously listed agreed to a cooperative course of action, with MDEQ/AMRB designated as the lead agency. The agencies established the following objectives:

- to identify and prioritize those abandoned mine sites that are presently the most serious threats to public health and safety and the environment;
- to collect data on each priority site in a consistent manner to identify problems associated with each site and to directly compare and rank sites. All sampling and analysis methods will strictly follow United States Environmental Protection Agency (EPA) protocols to ensure consistent and accurate results; and
- to develop a long-term strategy to utilize statutory and financial resources available to systematically reduce the hazards associated with the prioritized abandoned mine sites.

Upon completion of this report, the first two objectives stated above are fulfilled, and the framework to complete the third objective is in place.

1.2 PROJECT DESCRIPTION

The additional 25 priority sites investigated during the 1995 field season under the Abandoned Mines Hazardous Materials Inventory were located in 7 counties and in 10 out of the 206 mining districts in Montana. Site investigations began September 14, 1995, and were completed on November 13, 1995. One field crew consisting of three to four scientists, engineers, and technicians were in the field for approximately 14 days to complete the data collection effort.

The site investigation conducted at each site involved the following tasks: overall site reconnaissance; mapping; collection of tailings, slag, waste rock, adit discharge, flooded shafts, stream water, and sediment samples; field analysis of solid matrix samples using an X-ray Fluorescence (XRF) Spectrometer; and measurements of field parameters in water, including flow rates, pH, specific conductance, temperature,

<i>County</i>	<i>District</i>	<i>Site Name</i>	<i>PA #</i>
Cascade	Neihart	IXL/Eureka	07-083
Cascade	Neihart	Cornucopia	07-147
Cascade	Neihart	Ontario	07-148
Cascade	Neihart	Benton/Big Snowy	07-151
Cascade	Neihart	Lucky Strike	07-169
Cascade	Neihart	Lower Black Diamond Jay	07-174
Cascade	Neihart	Haystack Creek	07-179
Granite	Combination	Combination II	20-009
Granite	Combination	Sunrise/Queen Millsite	20-036
Granite	Phillipsburg	Douglas Creek Waste Rock	20-503
Granite	Princeton	Port Royal Mill Tailings	20-016
Jefferson	Basin	Bullion Smelter	22-505
Jefferson	Clancy	Frohner	22-243
Judith Basin	Hughesville	Carter	23-019
Judith Basin	Hughesville	M.T.A.	23-040
Judith Basin	Hughesville	Belfont	23-060
Judith Basin	Hughesville	Sinclair	23-501
Judith Basin	Hughesville	May and Edna	23-502
Park	Big Timber Canyon	Stemwinder (South)	34-500
Powell	Emery	Emma Darling	39-027
Powell	Emery	Bonanza	39-501
Powell	Emery	Hidden Hand	39-502
Powell	Emery	Spring Creek	39-503
Sanders	Plains	S & H	45-017
Sweetgrass	Big Timber Canyon	Kelly	34-113

TABLE 1-1: 1995 ABANDONED MINE PRIORITY SITES

oxidation reduction potential, and alkalinity. The field team members also photographed sample locations and significant site features, video taped the site, and evaluated safety hazards.

The physical setting and topography associated with these sites ranged from gently sloping land in valley bottoms to very steep, high elevation, mountainous areas. Access to sites was often difficult due to poor road conditions or absence of maintained roads. Access to several sites was limited to travel on foot or by helicopter. Ownership of the priority sites is a mix of public lands (USFS, BLM, etc.) and patented lands (private ownership). The priority sites consist of primarily inactive/abandoned mine sites; however, exploration activities were in progress at a few of the sites.

Significant features at the sites included tailings ponds, impoundments, and piles; waste rock dumps or piles; mine openings, including adits, shafts, glory holes, and exploration trenches; miscellaneous buildings and structures; and roads. Mine opening discharges and streams adjacent to or flowing through the sites were common.

Hazardous materials observed at some of the sites included copper sulfate and a barrel full of an unknown liquid. Some of the sites support wildlife, domestic grazing, or aquatic life. Residential occupation of the sites was observed in rare cases, but residences located adjacent to the sites occurred more frequently.

1.3 SUMMARY OF FINDINGS

The following information is provided as an overview of the data compiled during the 1995 supplemental investigation to the Hazardous Materials Inventory.

Laboratory Sampling

- Total number of lab samples: 125 (does not include the QA/QC duplicates), representing approximately 2,019 data points generated by the laboratories.
- Total number of XRF samples: 375 (does not include the QA/QC duplicates), representing approximately 5,196 data points.

Waste Rock Associated with the 1995 Priority Sites

- Estimated total volume: 172,744 cubic yards.
- Estimated total area: 723,665 square feet (16.6 acres).
- Estimated total unvegetated/uncovered area: 556,691 square feet (12.8 acres).

Mill Tailings Associated with the 1995 Priority Sites

- Estimated total volume: 597,692 cubic yards.
- Estimated total area: 2,642,075 square feet (60.7 acres).
- Estimated unvegetated/uncovered area: 777,344 square feet (17.8 acres).

Slag Material Associated with the 1995 Priority Sites

- Estimated total volume: 737 cubic yards.
- Estimated total area: 1,100 square feet (0.2 acre).
- Estimated unvegetated/uncovered area: 1,100 square feet (0.2 acre).

Adit Discharges Associated with the 1995 Priority Sites

- Total number of discharging adits: 14.
- Number of adit discharges with pH $\leq$ 5.00: 2.
- Number of adit discharges with pH $\leq$ 6.00: 3.

Flooded Shafts Associated with the 1995 Priority Sites

- Total number of open shafts with water: 0.

Water Quality Criteria

- Number of discharges exceeding Safe Drinking Water Act MCL/MCLGs: 3.
- Number of adit discharges exceeding acute aquatic life criteria: 8.
- Number of adit discharges exceeding chronic aquatic life criteria: 9.
- Number of observed releases to surface water/sediment directly attributable: 9.
- Acute aquatic life exceedances in surface water: 12.
- Chronic aquatic life exceedances in surface water: 14.
- MCL exceedances in surface water attributable to the site: 7.

2.0 INVESTIGATION METHODS

2.1 DATABASE AND LITERATURE SEARCH

Data collected in the field was supplemented by an extensive literature search and the use of several computer databases. This supplemental information was used to complete the inventory forms and fulfill receptor information requirements for the AIMSS. The computer databases used to collect this information were:

- The Montana Bureau of Mines and Geology (MBMG) Well Logs Database, which was compiled by the MBMG and the DNRC. This database was used to estimate the number of wells within a one-and four-mile radius of each site.
- The Montana Rivers Information System (MRIS), Version 2.0, compiled by the Montana State Library for the Montana Department of Fish, Wildlife, and Parks (MDFWP). This database was used to assign classifications relating to riparian habitat quality, wetlands frontage, fisheries habitat and species classification, and sport fisheries classification for stream reaches potentially impacted by each site, where applicable.
- The MDEQ/Water Quality Bureau (WQB) - Community Water Supplies Database. The MDEQ/WQB provided a list of surface water resources presently used for drinking water supplies in Montana.

Additional information was obtained from the following sources:

- Peak and average stream flow estimates were obtained from United States Department of Interior/Geological Survey (USGS) flow monitoring reports on gaged streams.
- Population estimates were obtained by counting buildings delineated on the USGS quadrangle maps and USFS Forest Visitors Maps. Field observations supplemented this source of information.
- Land ownership was determined from USFS Forest Visitor Maps, unless more accurate records were available.
- Historic mine/millsite operations, mineralogy, and geology were obtained from several sources, including: United States Bureau of Mines (USBM) Circulars, USGS Bulletins and Professional Papers, and MBMG Memoirs, Bulletins, and Circulars.

- Historic analytical data were obtained from the MDEQ/AMRB project files, the MDEQ/ERD project files, the MDEQ/WQB, USFS project files, and MBMG data collected for the USFS. This data was reviewed prior to site visits to provide the investigators with background information on potential hazards associated with each site.

2.2 FIELD METHODS

A detailed discussion of specific investigation methodologies is found in the MDEQ/AMRB Hazardous Materials Inventory SAP (MDEQ/AMRB-Pioneer, 1994a). The purpose of this section is to describe some of the unique details of the investigative methods used to fulfill the project objectives.

The inventory form used during the 1995 investigation was almost identical to the 1994 form. The inventory form was used during the investigation to guide and focus the investigative tasks to ensure consistent evaluation of each site. Literature and database searches were performed prior to the field investigations to provide investigators with background information on each site.

Sampling was performed on waste rock dumps, mill tailings, streams, ponds, adit discharges, and from domestic groundwater wells or monitoring wells, when present.

Each mill tailings deposit was characterized both spatially and vertically by hand-auguring to determine accurate depths and delineate stratification or differences in metals concentrations between the upper oxidized zone(s) and the lower reduced zones. Subsamples were collected from each visually distinct strata.

Typically, several subsamples were collected from each waste rock dump in order to better characterize these very heterogeneous waste sources. Subsamples from the tailings and waste rock were analyzed in the field using XRF Spectrometers. The field screening data allowed the investigators to make informed decisions on the number of samples required for laboratory analyses and indicated how best to composite the subsamples from the potential sources in order to send representative samples to the laboratory, while minimizing the number of samples to achieve this end. The XRF analyses also provided an increased number of valid and discrete data points per site achieving a more thorough understanding of the problems associated with each site. Solids were characterized additionally by field measurement of pH and radioactivity.

Stream sediment samples were also analyzed in the field with the XRF in order to assist in the assessment the extent of contamination and migration from the waste sources.

Surface water sampling was often conducted to characterize impacts to drainage basins, as well as contributions from individual sites, when multiple sources were

present. Waters were additionally characterized in the field by measuring flow rates, pH, specific conductance, alkalinity, and temperature.

Site mapping was conducted using a Global Positioning System supplemented with standard "Chain and Compass" surveying techniques when necessary. The primary purpose of mapping was to estimate volume and area of waste sources and record sample locations. Other significant site features, such as streams or drainages, roads, mine openings, and structures, were also recorded on the site sketches. Sample locations and other significant site features were documented on photographic slides and video tape to assist the resource managers in their evaluation of the priority sites.

3.0 DATA EVALUATION AND COMPARISONS

The purpose of this section is to discuss data quality validation and evaluation, as well as comparisons of the data to pertinent criteria.

3.1 DATA VALIDATION AND EVALUATION

3.1.1 Laboratory Data Validation and Evaluation

The laboratory utilized during this investigation complied all of the QA/QC performance requirements defined in the Contract Laboratory Program (CLP) Statement of Work (SOW, March 1990). The data packages provided by the laboratory allowed comprehensive data validation and evaluation procedures to be completed. Laboratory data validation and evaluation were performed according to guidelines developed by the EPA.

The laboratory data were validated in accordance with the document Laboratory Data Validation Functional Guidelines for Evaluating Inorganics (EPA, 1988). The data validation procedures were performed partially by laboratory chemists and partially by a data reviewer from Pioneer Technical Services, Inc. The data validation procedure included an evaluation of the following:

- holding times;
- initial and continuing calibrations;
- calibration and preparation blanks;
- inductively coupled plasma (ICP) interference check samples;
- laboratory control samples (LCS);
- laboratory duplicate sample analyses (precision assessment);
- matrix spike sample analyses (accuracy assessment);
- furnace atomic absorption (AA) quality control;
- ICP serial dilutions;
- sample result verification;
- field blank analyses; and
- overall assessment of data for the case.

Data evaluation occurred after the data validation process was completed and the appropriate qualifiers had been applied to the data. The data evaluation process involved a statistical analysis of the data to identify outliers and assess the quality of the data overall. Data evaluation was performed on the laboratory data which met the Data Quality Objectives (DQOs) outlined in the QAPjP for the Abandoned Mines Hazardous Materials Inventory (MDEQ/AMRB-Pioneer, 1994b).

Although numerous qualifications (flags) were applied to the laboratory data compiled during this investigation, and a small portion of the data were evaluated as outliers, none of the data were flagged "R" or were otherwise considered unusable. Consequently, 100 percent of the laboratory data (soil and water) collected during this investigation are considered valid and useable for all of the objectives of this project.

The limitations of the data should be considered when making interpretations. Please refer to the document entitled Data Validation and Evaluation Report for the Abandoned Mines Hazardous Materials Inventory for a detailed description of the procedures followed and results provided by the overall data assessments.

3.1.2 X-Ray Fluorescence Spectrometer Data Validation

Data provided by the field portable XRF Spectrometer were also validated; the XRF data were validated according to manufacturer specifications. The validation procedures for XRF data were not as rigorous as for laboratory data; consequently, additional procedures, utilizing standard statistical techniques, were employed to evaluate the overall quality of the XRF data. These additional procedures included assessment of XRF duplicate data to quantify precision, as well as comparing XRF data to corresponding laboratory data to assess inter-method precision and correlation.

3.1.3 Other Field Measurements

Field parameter measurements, such as pH, Eh, and specific conductance, were not evaluated for data quality. SOPs (MDEQ/AMRB-Pioneer, 1994a) were carefully followed in the field to achieve a consistent and acceptable level of quality.

3.2 DATA INTERPRETATION

The analytical data collected was compared to site-specific background or upgradient concentrations, as well as drinking water standards and aquatic life criteria. The following sections explain how these comparisons were made.

3.2.1 Background Soil Comparison

Background soil samples were collected to establish the extent to which metals concentrations were elevated in comparison to the local background. Constituents present at concentrations greater than three times background concentrations were considered "attributable" to the site. Background samples were typically applied to groups of sites in close proximity to one another and within similar geologic units. Occasionally, background samples collected during the 1993 and 1994 investigations were used.

3.2.2 Observed Releases to Groundwater, Surface Water, and Sediment

An observed release to surface water is defined as a downstream surface water or stream sediment sample concentration at more than three times the upstream surface water or sediment sample concentration, for any constituent that can be attributed to the site. Groundwater, surface water, and stream sediment analytical data were used to document observed releases from the priority sites.

3.2.3 MCL/MCLG, Aquatic Life Criteria Comparisons

Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) are drinking water standards promulgated under the federal Safe Drinking Water Act (SDWA; 40 CFR Parts 141, 143). MCLs, and MCLGs apply to public water systems; however, they may be relevant and appropriate to surface or groundwater if those waters are used as drinking water. Groundwater and surface water metals concentrations observed in samples collected were evaluated against these standards. The current SDWA MCLs and MCLGs expressed in micrograms per liter ($\mu\text{g/L}$) are:

Arsenic: 50 $\mu\text{g/L}$	Barium: 2,000 $\mu\text{g/L}$	Cadmium: 5 $\mu\text{g/L}$
Copper: 1,300 $\mu\text{g/L}$	Chromium: 100 $\mu\text{g/L}$	Mercury: 2 $\mu\text{g/L}$
Nickel: 100 $\mu\text{g/L}$	Antimony: 6 $\mu\text{g/L}$	Lead: 15 $\mu\text{g/L}^*$
Cyanide: 200 $\mu\text{g/L}$		

*Not an MCL, but an action level.

Surface water and mine discharge analytical results were also evaluated against the freshwater acute and chronic aquatic life criteria as presented in the Montana Numeric Water Quality Standards, Circular WQB-7, July 15, 1995. Some of these criteria are expressed as a function of total hardness and were corrected for the hardness measured in each sample, when applicable.

3.3 DATA MANAGEMENT

The data collected under this project has been input into the data manager dBase IV, Version 2.0. Four files were created to contain the data and aid in any manipulation of the data that may be desired. These files are summarized briefly below.

- PTSDATA.DBF contains field data collected for each sample during the Hazardous Materials Inventory;
- XRFDATA.DBF contains all the XRF analytical results generated in the field during the Hazardous Materials Inventory;

- LABDATA.DBF contains the data from all of the laboratory analyses performed during the Hazardous Materials Inventory; and
- PRIORITY.DBF is the modified dBase file provided to Pioneer by MDEQ/AMRB from the master inventory.

The information from these four files can be readily combined with one another to form a relational database.

4.0 SITE RANKING

The final task of the Hazardous Materials Inventory involved the development of a system to rank the severity of hazards or environmental threats associated with the sites investigated in order to assist the MDEQ/AMRB in prioritizing reclamation efforts and allocation of resources. This system, the Abandoned and Inactive Mines Scoring System (AIMSS), closely follows the EPA's Hazard Ranking System, although the AIMSS is specifically focused on potential hazards typically associated with the abandoned or inactive hardrock mines.

The AIMSS also evaluated potential safety hazards associated with the sites such as hazardous mine openings, highwalls, and structures, and generated a separate safety score for each site. The AIMSS utilized the data collected for each site to assign a ranking score.

The AIMSS is focused towards the physical site setting and potential hazards associated with abandoned and inactive mines due to its capability to evaluate mine opening discharges and large quantities of mine wastes. The AIMSS scoring method evaluates relative risks between sites. This accounts for site-specific contaminant concentrations and the varying toxicity of different constituents, as well as adit discharges in the source evaluation. This method more effectively discriminates between sites with higher concentrations or more toxic constituents in relation to sites with lower concentrations or less toxic constituents. In order to generate an overall Mine Site Human Health and Environmental Hazard Score, the AIMSS evaluates the groundwater pathway, surface water pathway, air pathway, and direct contact pathway. Under each pathway, the AIMSS evaluates observed releases, potential to release, pathway characteristics, waste characteristics, and targets.

Table 4-1 lists the 1995 supplemental priority sites and their associated AIMSS score, sorted in descending order. The necessary data for ranking each of the 1995 inventory sites was collected.

The AIMSS also generates a distinct safety score for each site by evaluating site accessibility and safety hazards present (i.e., shafts, stopes, open adits, hazardous structures, and explosives/other hazardous materials or chemicals). Table 4-2 lists the 1995 supplemental priority sites and their associated safety score, sorted in descending order.

The Hazardous Materials Inventory previously investigated 328 abandoned or inactive hardrock mine sites in 1993 and 1994. Table 4-3 lists all of the screened priority sites investigated during all three years and their associated AIMSS score, sorted in descending order. Table 4-4 lists the all of the screened priority sites and their associated safety score, sorted in descending order.

The Hazardous Materials Inventory involved the investigation of a total of 353 abandoned or inactive hardrock mine sites. Sixty-one sites were dropped from the Abandoned Hardrock Mines Priority Sites list due to a lack of any significant environmental hazards associated with these sites. Table 4-5 lists all the dropped sites, including those previously dropped and those reclaimed in 1995. These sites were removed from the priority list because they did not represent a significant risk to human health or the environment for one or more of the following reasons:

- The site did not contain significant concentrations or quantities of heavy metals or other potentially hazardous materials;
- Contaminant migration pathways were not present to potentially impact human health or the environment;
- Active mining was occurring on the sites at the time of the investigation, preventing accurate characterization of the risks as an abandoned or inactive mine site; or
- Sites were previously reclaimed and risks to human health and the environment had been adequately addressed.

The sites dropped may require additional evaluation at some time in the future due to the potential for changing site conditions or regulatory statutes. These sites may be reinstated on the Abandoned Hardrock Mines Priority Sites List, if warranted.

<i>1995 RANK</i>	<i>County</i>	<i>District</i>	<i>Site Name</i>	<i>PA #</i>	<i>AIMSS SCORE</i>
1	Granite	Combination	Combination II	20-009A	99.32
2	Powell	Emery	Spring Creek Tailings	39-503	28.13
3	Jefferson	Clancy	Frohner	22-243	22.68
4	Granite	Phillipsburg	Douglas Creek Waste Rock	20-503	14.10
5	Powell	Emery	Hidden Hand	39-502	6.53
6	Cascade	Neihart	Benton/Big Snowy	07-151	2.67
7	Cascade	Neihart	Lower Black Diamond Jay	07-174	2.06
8	Powell	Emery	Bonanza	39-501	1.20
9	Cascade	Neihart	Haystack Creek	07-179	1.18
10	Judith Basin	Hughesville	Carter	23-019	1.14
11	Powell	Emery	Emma Darling	39-027	1.07
12	Cascade	Neihart	Cornucopia	07-147	1.00
13	Cascade	Neihart	IXL/Eureka	07-083	0.84
14	Judith Basin	Hughesville	Sinclair	23-501	0.77
15	Granite	Princeton	Port Royal Mill Tailings	20-016	0.64
16	Judith Basin	Hughesville	Belfont	23-060	0.40
17	Judith Basin	Hughesville	M.T.A	23-040	0.36
18	Sanders	Plains	S & H	45-017	0.29
19	Judith Basin	Hughesville	May and Edna	23-502	0.25
20	Granite	Combination	Sunrise/Queen Millsite	20-036	0.22
21	Park	Big Timber Canyon	Sternwinder (South)	34-500	0.16
22	Jefferson	Basin	Bullion Smelter	22-505	0.11
23	Cascade	Neihart	Lucky Strike	07-169	0.06
24	Sweetgrass	Big Timber Canyon	Kelly	34-113	0.03
25	Cascade	Neihart	Ontario	07-148	0.01

TABLE 4-1: 1995 ABANDONED HARDROCK MINES PRIORITY SITES AMISS RANKING

<i>1995</i> RANK	County	District	Site Name	PA #	SAFETY SCORE
1	Powell	Emery	Hidden Hand	39-502	145.60
2	Powell	Emery	Emma Darling	39-027	76.80
3	Sanders	Plains	S & H	45-017	75.00
4	Powell	Emery	Bonanza	39-501	67.20
5	Judith Basin	Hughesville	Sinclair	23-501	45.00
6	Cascade	Neihart	Haystack Creek	07-179	44.00
7	Judith Basin	Hughesville	M.T.A	23-040	42.00
8	Granite	Combination	Sunrise/Queen Millsite	20-036	30.80
9	Granite	Phillipsburg	Douglas Creek Waste Rock	20-503	24.60
10	Cascade	Neihart	Lucky Strike	07-169	23.70
11	Judith Basin	Hughesville	Carter	23-019	19.80
12	Jefferson	Basin	Bullion Smelter	22-505	18.40
13	Jefferson	Clancy	Frohner	22-243	7.80
14	Cascade	Neihart	IXL/Eureka	07-083	7.40
15	Cascade	Neihart	Cornucopia	07-147	6.90
16	Cascade	Neihart	Lower Black Diamond Jay	07-174	2.55
17	Cascade	Neihart	Benton/Big Snowy	07-151	1.90
18	Judith Basin	Hughesville	Belfont	23-060	1.25
19	Cascade	Neihart	Ontario	07-148	1.15
20	Sweetgrass	Big Timber Canyon	Kelly	34-113	1.00
21	Park	Big Timber Canyon	Stemwinder (South)	34-500	1.00
22	Powell	Emery	Spring Creek Tailings	39-503	0.00
23	Granite	Princeton	Port Royal Mill Tailings	20-016	0.00
24	Judith Basin	Hughesville	May and Edna	23-502	0.00
25	Granite	Combination	Combination II	20-009A	0.00

TABLE 4-2: 1995 ABANDONED HARDROCK MINES PRIORITY SITES SAFETY RANKING

TABLE 4-3
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
AIMSS RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	AIMSS SCORE
1	Jefferson	Colorado	CORBIN FLATS	22-004	4698.59
2	Lewis & Clark	Helena	Joslyn Street Tailings	25-501	1892.74
3	Lewis & Clark	Rimini	RED MOUNTAIN	25-019	1628.48
4	Lewis & Clark	Rimini	National Extension	25-287	1305.48
5	Powell	Emery	EMERY	39-004	879.62
6	Lewis & Clark	Rimini	RED WATER	25-007	859.17
7	Ravalli	Curlew	CURLEW	41-003	625.00
8	Cascade	Hughesville	BLOCK P TAILINGS	07-090	536.80
9	Lewis & Clark	Marysville	PIEGAN GLOSTER MILL	25-172	516.81
10	Jefferson	High Ore	COMET	22-009	510.15
11	Lewis & Clark	Rimini	VALLEY FORGE/SUSIE	25-008	500.06
12	Powell	Elliston	CHARTER OAK	39-003	490.48
13	Lewis & Clark	Helena	SPRING HILL TAILINGS	25-067	456.20
14	Granite	Philipsburg	DOUGLAS CREEK TAILINGS	20-003	347.98
15	Judith Basin	Hughesville	BLOCK P MINE	23-001	326.17
16	Jefferson	Colorado	ALTA	22-001	262.52
17	Granite	Philipsburg	SCRATCH ALL	20-019	250.58
18	Jefferson	Colorado	WASHINGTON	22-007	250.25
19	Jefferson	Basin	ENTERPRISE	22-074	245.76
20	Broadwater	Indian Creek	PARK	04-012	240.40
21	Lewis & Clark	Marysville	EMPIRE MILLSITE	25-175	240.27
22	Jefferson	Cataract	CRYSTAL MINE	22-073	238.88
23	Lewis & Clark	Rimini	UPPER VALLEY FORGE	25-280	230.11
24	Flathead	Hog Heaven	FLATHEAD MINE COMPLEX	15-012	180.73
25	Lewis & Clark	Marysville	GOLDSIL MILLSITE	25-365	180.51
26	Mineral	Cedar Creek	NANCY LEE MILLSITE - SLOWEY	31-090	175.41
27	Lewis & Clark	Rimini	Peerless Jenny/King	25-006	169.49
28	Broadwater	Winston	EAST PACIFIC	04-008	169.32
29	Cascade	Neihart	SILVER DYKE ADIT	07-135	160.86
30	Judith Basin	Hughesville	EDWARDS	23-046	152.66
31	Jefferson	Clancy	NELLIE GRANT	22-244	135.64
32	Granite	Combination	COMBINATION MILL	20-009	127.02
33	Lewis & Clark	Rimini	ARMSTRONG MINE	25-102	108.59
34	Cascade	Neihart	CARPENTER CREEK TAILINGS	07-103	103.53
35	Jefferson	Basin	BULLION	22-008	99.48
36	Granite	Combination	COMBINATION II	20-009A	99.32
37	Park	New World	Great Republic Smelter	34-000	97.89
38	Silver Bow	Basin Creek	HIGHLAND	47-028	97.74
39	Lewis & Clark	Rimini	LOWER TENMILE MILL	25-030	97.38
40	Lewis & Clark	Scratchgravel	FRANKLIN	25-339	86.59
41	Granite	Philipsburg	Wenger #2	20-077	81.42
42	Lewis & Clark	Rimini	TENMILE MINE	25-005	79.90
43	Madison	Norris/Red Bluff	BOAZ MINE	29-013	76.47
44	Meagher	Castle Mountain	CUMBERLAND	30-004	76.22
45	Mineral	Keystone	NANCY LEE MILLSITE	31-082	73.28
46	Lincoln	Libby	SNOWSHOE MINE	27-005	69.39
47	Cascade	Neihart	SILVER DYKE TAILINGS	07-137	68.15

TABLE 4-3
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
AIMSS RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	AIMSS SCORE
48	Granite	Maxville	AXVILLE TAILINGS/LONDONDERR	20-209	65.54
49	Lewis & Clark	Marysville	BALD BUTTE MILLSITE	25-179	60.59
50	Granite	Philipsburg	TROUT	20-062	57.60
51	Lewis & Clark	Rimini	Monte Cristo	25-275	55.69
52	Jefferson	Basin	BUCKEYE	22-072	55.45
53	Jefferson	Elkhorn	Elkhorn Creek Tailings	22-502	53.99
54	Granite	Philipsburg	BI-METALLIC/OLD RED	20-002	52.20
55	Missoula	Cramer Creek	LINTON MINE AND MILLSITE	32-017	49.35
56	Jefferson	Colorado	GREGORY	22-005	47.21
57	Madison	Rochester	THISTLE MINE/TAILINGS	29-073	47.02
58	Jefferson	Alhambra	MIDDLE FORK WARM SPRINGS	22-046	46.31
59	Madison	Pony	Garnet Gold	29-035	45.73
60	Silver Bow	Elk Park	MARY EMMEE/CLINTON	47-035	43.53
61	Beaverhead	Ermont	ERMONT MILL	01-005	41.98
62	Cascade	Neihart	Queen of the Hills	07-085	40.68
63	Sanders	Plains	MONTRO GOLD	45-010	39.91
64	Granite	Philipsburg	GRANITE MOUNTAIN	20-110	38.66
65	Madison	Sheridan	BUCKEYE	29-451	37.81
66	Cascade	Neihart	NEIHART TAILINGS	07-134	37.58
67	Jefferson	Colorado	BLUEBIRD	22-003	32.47
68	Granite	Dunkleburg	FOREST ROSE	20-004	30.87
69	Madison	South Boulder	MAMMOTH TAILINGS	29-082	30.59
70	Powell	Elliston	LILY/ORPHAN BOY	39-006	29.39
71	Judith Basin	Hughesville	WRIGHT LODGE	23-045	29.30
72	Madison	Sheridan	SE SW SECTION 26	29-474	28.44
73	Cascade	Neihart	SILVER DYKE MILL	07-138	28.33
74	Powell	Emery	SPRING CREEK TAILINGS	39-503	28.13
75	Judith Basin	Hughesville	HARRISON	23-056	27.04
76	Jefferson	Basin	Josephine	22-031	26.80
77	Broadwater	Winston	Sunrise/January	04-130	26.59
78	Lewis & Clark	Rimini	Queensbury	25-262	26.24
79	Madison	Washington	MISSOURI	29-373	24.42
80	Cascade	Neihart	DACOTAH	07-121	22.91
81	Jefferson	Clancy	FROHNER	22-243	22.68
82	Jefferson	Colorado	BERTHA	22-002	21.92
83	Beaverhead	Bannack	GOLD LEAF/ PRISCILLA	01-031	20.66
84	Deer Lodge	Silver Lake	GOLD COIN	12-004	17.50
85	Gallatin	Bozeman	KARST ASBESTOS	16-018	17.34
86	Jefferson	Elkhorn	Carmody	22-337	16.48
87	Granite	Philipsburg	ALGONQUIN	20-005	16.12
88	Lewis & Clark	Marysville	BIG OX MILLSITE	25-115	16.04
89	Madison	Virginia City	Prospect	29-136	15.91
90	Madison	Silver Star	BROADWAY/VICTORIA	29-179	15.53
91	Missoula	Woodman	WARD LODGE MINE	32-005	14.72
92	Granite	Philipsburg	DOUGLAS CREEK WASTE ROCK	20-503	14.10
93	Sanders	Blue Creek	BROKEN HILL	45-005	13.80
94	Lewis & Clark	Stemple	NE NW SECTION 13	25-197	13.66

TABLE 4-3
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
AIMSS RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	AIMSS SCORE
95	Powell	Elliston	ONTARIO MILLSITE	39-010	13.63
96	Lincoln	Libby	CHERRY CREEK MILL	27-006	13.20
97	Broadwater	Winston	Kleinschmidt	04-010	12.77
98	Madison	South Boulder	MAMMOTH	29-008	12.62
99	Lewis & Clark	Lincoln	BLACKFOOT TAILINGS	25-322	12.57
100	Cascade	Neihart	Rebellion Upper & Lower	07-157	12.12
101	Cascade	Neihart	Hartley	07-082	11.73
102	Jefferson	Colorado	ARGENTINE	22-102	11.36
103	Powell	Elliston	SURE THING	39-020	10.59
104	Granite	Philipsburg	TRUE FISSURE	20-111	10.57
105	Madison	Virginia City	U.S. Grant	29-095	10.57
106	Jefferson	Cataract	EVA MAY	22-075	10.15
107	Cascade	Neihart	Broadwater	07-079	10.08
108	Jefferson	Basin	Old Basin Millsite	22-500	9.59
109	Lewis & Clark	Rimini	Woodrow Wilson	25-258	9.58
110	Lewis & Clark	Marysville	Drumlummon Mine/Mill/Tailings	25-024	9.40
111	Beaverhead	Elkhorn	OLD ELKHORN	01-169	8.81
112	Granite	South Boulder	NONPAREIL	20-012	7.75
113	Jefferson	Elkhorn	QUEEN/TOURMALINE QUEEN	22-111	7.74
114	Judith Basin	Hughesville	TIGER	23-059	7.67
115	Jefferson	Elkhorn	ELKHORN QUEEN	22-027	7.51
116	Broadwater	Indian Creek	Bullion King	04-081	7.03
117	Lewis & Clark	Marysville	BALD MOUNTAIN	25-061	7.00
118	Madison	Virginia City	PACIFIC	29-118	6.62
119	Powell	Emery	HIDDEN HAND	39-502	6.53
120	Cascade	Neihart	EVENING STAR MINE AND MILLSITE	07-087	6.42
121	Park	New World	LOWER GLENGARRY	34-006	6.23
122	Mineral	Iron Mountain	DILLON MILLSITE	31-073	6.10
123	Madison	Pony	BOSS TWEED	29-034	6.05
124	Park	New World	BLACK WARRIOR	34-079	6.04
125	Beaverhead	Hecla	LOWER AND UPPER CLEVE	01-143	5.99
126	Jefferson	Cataract	Boulder Chief	22-132	5.93
127	Cascade	Neihart	BIG SEVEN MINE	07-156	5.68
128	Lewis & Clark	Rimini	BEATRICE	25-103	5.47
129	Granite	Philipsburg	Little Gem	20-071	5.44
130	Broadwater	Indian Creek	ST. LOUIS	04-013	5.34
131	Park	New World	MCLAREN TAILINGS	34-004	5.24
132	Broadwater	Radersburg	KEATING TAILINGS	04-121	4.95
133	Jefferson	Cataract	Crescent/Alsace	22-106	4.82
134	Jefferson	High Ore	GREY EAGLE	22-029	4.75
135	Granite	Antelope Creek	SILVER KING	20-186	4.36
136	Madison	Pony	STRAWBERRY MINE	29-038	4.32
137	Madison	Sheridan	LAKE SHORE MINE	29-436	4.08
138	Mineral	Iron Mountain	IRON MOUNTAIN MILLSITE	31-010	4.07
139	Beaverhead	Hecla	True Blue	01-138	4.04
140	Fergus	Warm Springs	Gilt Edge Tailings	14-008	4.03
141	Cascade	Neihart	SILVER BELT	07-111	4.00

TABLE 4-3
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
AIMSS RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	AIMSS SCORE
142	Jefferson	Basin	BASIN MILLSITE	22-036	3.98
143	Broadwater	Winston	Chartam	04-501	3.94
144	Powell	Elliston	JULIA	39-022	3.88
145	Jefferson	Cataract	Rocker/Ada	22-170	3.79
146	Broadwater	Winston	Golden Age	04-050	3.78
147	Beaverhead	Bannack	APEX MILLSITE	01-006	3.75
148	Madison	Sheridan	UNCLE SAM	29-383	3.42
149	Cascade	Neihart	MOLTON	07-084	3.30
150	Lewis & Clark	Stemple	SWANSEA TAILINGS/MINE	25-208	3.28
151	Fergus	Warm Springs	Prestor John	14-090	3.05
152	Park	New World	MCLAREN MINE	34-010	2.84
153	Cascade	Neihart	FAIRPLAY	07-112	2.76
154	Sanders	White Pine	JACK WAITE	45-002	2.68
155	Cascade	Neihart	BENTON/BIG SNOWY	07-151	2.67
156	Broadwater	Radersburg	OHIO	04-009	2.64
157	Powell	Elliston	ANNA P./ HATTIE M.	39-044	2.59
158	Meagher	Smith River	SW NE S10	30-078	2.53
159	Judith Basin	Hughesville	Danny T.	23-500	2.48
160	Jefferson	Elkhorn	SOURDOUGH	22-336	2.36
161	Madison	Rochester	EMMA	29-061	2.27
162	Cascade	Hughesville	BON TON	07-094	2.19
163	Madison	Sheridan	LATEST OUT	29-354	2.18
164	Jefferson	Cataract	MORNING GLORY	22-077	2.13
165	Jefferson	Basin	Lady Leith (NE NW S6)	22-316	2.13
166	Beaverhead	Lost Creek	TUNGSTEN MILLSITE	01-170	2.11
167	Cascade	Neihart	LOWER BLACK DIAMOND JAY	07-174	2.06
168	Mineral	Keystone	NANCY LEE MINE	31-001	2.04
169	Jefferson	Colorado	Crawley Camp	22-028	2.03
170	Lewis & Clark	Stemple	ASTOR	25-227	2.02
171	Missoula	Clinton	Wallace Creek Mill	32-019	1.96
172	Silver Bow	Moose Creek	MIDDLE FORK MILLSITE	47-081	1.96
173	Silver Bow	Elk Park	RISING SUN	47-037	1.95
174	Jefferson	Alhambra	SOLAR SILVER	22-054	1.91
175	Jefferson	Alhambra	ALHAMBRA HOT SPRINGS	22-049	1.84
176	Beaverhead	Birch Creek	INDIAN QUEEN	01-034	1.81
177	Madison	Sheridan	NW SE SECTION 26	29-476	1.79
178	Cascade	Neihart	ROCHESTER	07-110	1.61
179	Missoula	Ninemile	LOST CABIN MINE	32-011	1.55
180	Broadwater	Winston	Custer Millsite	04-006	1.51
181	Mineral	Iron Mountain	BELLE OF THE HILLS	31-072	1.50
182	Judith Basin	Hughesville	BELT PATENT MINE/TAILINGS	23-035	1.42
183	Beaverhead	Hecla	TRAPPER	01-144	1.40
184	Granite	Moose Lake	BANNER TAILINGS	20-175	1.39
185	Lewis & Clark	Rimini	Peter	25-259	1.39
186	Madison	Virginia City	EASTON	29-121	1.33
187	Powell	Elliston	GOLDEN ANCHOR	39-012	1.29
188	Jefferson	Basin	JACK CREEK TAILINGS	22-296	1.22

TABLE 4-3
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
AIMSS RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	AIMSS SCORE
189	Mineral	Keystone	LITTLE ANACONDA MINE	31-077	1.22
190	Lewis & Clark	Lincoln	SEVEN-UP PETE	25-020	1.20
191	Powell	Emery	BONANZA	39-501	1.20
192	Madison	Sheridan	GOLDSCHMIDT/STEINER	29-078	1.19
193	Cascade	Neihart	HAYSTACK CREEK	07-179	1.18
194	Powell	Elliston	MOUNTAIN VIEW	39-062	1.16
195	Cascade	Neihart	Ripple Mines	07-163	1.14
196	Jefferson	Clancy	GENERAL GRANT	22-245	1.14
197	Judith Basin	Hughesville	CARTER	23-019	1.14
198	Jefferson	Elkhorn	TACOMA	22-284	1.11
199	Powell	Emery	EMMA DARLING	39-027	1.07
200	Cascade	Neihart	CORNUCOPIA	07-147	1.00
201	Mineral	Packer Creek	TARBOX-MINERAL KING	31-003	1.00
202	Judith Basin	Hughesville	MOULTON	23-058	0.98
203	Granite	Frog Pond	Millers Mine	20-176	0.97
204	Stillwater	Stillwater	BENBOW MILLSITE	48-005	0.96
205	Missoula	Ninemile	NUGGET MINE	32-042	0.89
206	Lewis & Clark	Marysville	WILD CAT	25-317	0.88
207	Park	New World	FISHER CREEK NO.1	34-090	0.86
208	Lewis & Clark	Rimini	Monitor Creek Tailings	25-503	0.85
209	Cascade	Neihart	IXL/EUREKA	07-083	0.84
210	Cascade	Neihart	Lexington	07-167	0.83
211	Jefferson	Basin	Doris	22-293	0.79
212	Judith Basin	Hughesville	MARCELLINE	23-022	0.78
213	Broadwater	Confederate	MILLER	04-138	0.77
214	Granite	Alps	Argo	20-081	0.77
215	Judith Basin	Hughesville	SINCLAIR	23-501	0.77
216	Madison	Tidal Wave	B & H	29-083	0.75
217	Deer Lodge	Silver Lake	SILVER LAKE MILLSITE	12-070	0.74
218	Powell	Elliston	KIMBALL	39-018	0.74
219	Powell	Elliston	MONARCH	39-008	0.69
220	Park	New World	LITTLE DAISY	34-009	0.68
221	Granite	South Boulder	PORT ROYAL MILL TAILINGS	20-016	0.64
222	Granite	Phillipsburg	RUMSEY	20-018	0.64
223	Madison	Sheridan	BROADGAUGE MINE	29-293	0.64
224	Cascade	Neihart	Emma	07-144	0.63
225	Madison	Pony	ATLANTIC/PACIFIC	29-033	0.63
226	Judith Basin	Hughesville	NE SE S7 / LUCKY STRIKE	23-042	0.59
227	Sweet Grass	Independence	YAGER/DAISY	49-002	0.55
228	Jefferson	Elkhorn	Trumley Heap Leach	22-501	0.52
229	Missoula	Copper Cliff	Copper Cliff	32-001	0.49
230	Park	Emigrant	ALLISON	34-018	0.47
231	Granite	Dunkleburg	JACKSON PARK	20-027	0.46
232	Park	New World	GOLD DUST	34-007	0.46
233	Silver Bow	Melrose	CLIPPER	47-029	0.45
234	Jefferson	Colorado	WICKES SMELTER	22-358	0.44
235	Mineral	Packer Creek	SALTESE CONSOLIDATE	31-021	0.44

TABLE 4-3
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
AIMSS RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	AIMSS SCORE
236	Madison	Virginia City	Belle Mine	29-098	0.42
237	Missoula	Ninemile	JOE WALLIT MINE	32-010	0.42
238	Cascade	Neihart	MAUD S.	07-129	0.40
239	Judith Basin	Hughesville	BELFONT	23-060	0.40
240	Sanders	Trout Creek	HOLLIDAY MINE	45-009	0.40
241	Beaverhead	Wisdom	MARTIN	01-270	0.37
242	Missoula	Copper Cliff	Frogs Diner	32-027	0.37
243	Judith Basin	Hughesville	M.T.A	23-040	0.36
244	Lewis & Clark	Rimini	Bear Gulch Mine	25-504	0.35
245	Madison	Sheridan	SMUGGLER	29-010	0.35
246	Madison	Virginia City	KEARSAGE MINE	29-102	0.33
247	Powell	Elliston	HARD LUCK MINE	39-014	0.32
248	Lewis & Clark	Stemple	SE SW SECTION 10	25-212	0.31
249	Jefferson	Cataract	MANTLE EAST	22-032	0.29
250	Sanders	Plains	S & H	45-017	0.29
251	Cascade	Neihart	STALLABRASS	07-120	0.28
252	Madison	Tidal Wave	DRY GULCH (SOUTH)	29-282	0.28
253	Broadwater	Hellgate	ARGO MINE AND MILLSITE	04-015	0.27
254	Fergus	Warm Springs	CUMBERLAND	14-017	0.27
255	Granite	Garnet	Free Coin/Red Cloud	20-134	0.27
256	Deer Lodge	Orofino	CHAMPION	12-003	0.26
257	Judith Basin	Hughesville	MAY AND EDNA	23-502	0.25
258	Madison	Norris/Red Bluff	GRUBSTAKE	29-399	0.24
259	Lewis & Clark	Stemple	Jay Gould Mine/Mill	25-500	0.23
260	Granite	Dunkleburg	WASA	20-023	0.22
261	Granite	Combination	SUNRISE/QUEEN MILLSITE	20-036	0.22
262	Lewis & Clark	Marysville	BELMONT	25-167	0.22
263	Fergus	Warm Springs	TAIL HOLT	14-010	0.16
264	Granite	Alps	ALPS	20-065	0.16
265	Park	Big Timber Canyon	STEMWINDER SOUTH	34-500	0.16
266	Beaverhead	Wisdom	CLARA	01-262	0.15
267	Cascade	Neihart	SHERMAN NO. 2 (SOUTHWEST)	07-142	0.15
268	Lewis & Clark	Marysville	BIG OX MINE	25-116	0.14
269	Ravalli	Pleasant View	BLUEBIRD	41-009	0.14
270	Broadwater	Indian Creek	DIAMOND HILL	04-020	0.13
271	Cascade	Neihart	COMPROMISE	07-100	0.13
272	Jefferson	Elkhorn	Iron	22-359	0.13
273	Madison	Sheridan	RED PINE	29-079	0.13
274	Madison	Washington	SE SE SECTION 25	29-394	0.13
275	Silver Bow	Melrose	OLD GLORY	47-027	0.13
276	Stillwater	Nye	MOUAT MINE	48-001	0.13
277	Lewis & Clark	Ophir	VICTORY/EVENING STAR	25-010	0.12
278	Powell	Elliston	TELEGRAPH	39-023	0.12
279	Jefferson	Basin	BULLION SMELTER	22-505	0.11
280	Madison	Virginia City	APEX	29-105	0.11
281	Meagher	Beaver Creek	BIGLER MINE	30-067	0.11
282	Granite	Antelope Creek	ANT	20-194	0.09

TABLE 4-3
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
AIMSS RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	AIMSS SCORE
283	Park	New World	UPPER ALICE E.	34-085	0.09
284	Ravalli	Frog Pond	MONTANA PRINCE	41-004	0.09
285	Cascade	Neihart	LUCKY STRIKE	07-169	0.06
286	Granite	Moose Lake	OLD DOMINION MINE	20-180	0.06
287	Meagher	Castle Mountain	BELLE OF THE CASTLES	30-007	0.06
288	Powell	Elliston	THIRD TERM	39-024	0.06
289	Beaverhead	Hecla	SILVER KING	01-094	0.05
290	Sanders	Plains	LOWER LETTERMAN	45-047	0.05
291	Madison	Rochester	WATSECA	29-075	NS
292	Madison	Pony	CMC Pony Mill	29-500	NS

TABLE 4-4
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
SAFETY RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	SAFETY SCORE
1	Lewis & Clark	Scratchgravel	FRANKLIN	25-339	30330.00
2	Granite	Philipsburg	TROUT	20-062	6196.50
3	Granite	Philipsburg	Wenger #2	20-073	1152.00
4	Madison	Virginia City	Prospect	29-136	1102.50
5	Jefferson	Colorado	ALTA	22-001	1070.60
6	Granite	Philipsburg	Little Gem	20-071	1054.00
7	Broadwater	Indian Creek	PARK	04-012	940.80
8	Jefferson	High Ore	COMET	22-009	918.53
9	Lewis & Clark	Ophir	VICTORY/EVENING STAR	25-010	910.00
10	Lewis & Clark	Marysville	BALD MOUNTAIN	25-061	848.00
11	Jefferson	Cataact	MORNING GLORY	22-077	756.40
12	Granite	Philipsburg	ALGONQUIN	20-005	731.00
13	Granite	Philipsburg	TRUE FISSURE	20-111	714.00
14	Sweet Grass	Independence	YAGER/DAISY	49-002	710.00
15	Meagher	Castle Mountain	CUMBERLAND	30-004	630.00
16	Madison	Silver Star	BROADWAY/VICTORIA	29-179	627.50
17	Lewis & Clark	Marysville	Drumlummon Mine/Mill/Tailings	25-024	590.00
18	Madison	Virginia City	U.S. Grant	29-095	566.50
19	Park	New World	LOWER GLENGARRY	34-006	560.00
20	Judith Basin	Hughesville	MARCELLINE	23-022	555.00
21	Cascade	Neihart	COMPROMISE	07-100	522.00
22	Madison	Sheridan	BUCKEYE	29-451	490.00
23	Broadwater	Radersburg	OHIO	04-009	470.00
24	Lewis & Clark	Rimini	RED WATER	25-007	462.00
25	Madison	Pony	STRAWBERRY MINE	29-038	454.00
26	Jefferson	High Ore	GREY EAGLE	22-029	440.00
27	Jefferson	Elkhorn	Carmody	22-337	435.00
28	Jefferson	Basin	BULLION	22-008	425.00
29	Cascade	Neihart	Queen of the Hills	07-085	405.00
30	Granite	Philipsburg	DOUGLAS CREEK TAILINGS	20-003	404.00
31	Beaverhead	Hecla	LOWER AND UPPER CLEVE	01-143	390.00
32	Beaverhead	Ermont	ERMONT MILL	01-005	382.50
33	Granite	Philipsburg	SCRATCH ALL	20-019	364.65
34	Granite	Garnet	Free Coin/Red Cloud	20-134	325.50
35	Sanders	Plains	LOWER LETTERMAN	45-047	325.00
36	Jefferson	Alhambra	ALHAMBRA HOT SPRINGS	22-049	315.00
37	Granite	Moose Lake	BANNER TAILINGS	20-175	310.50
38	Judith Basin	Hughesville	BLOCK P MINE	23-001	308.00
39	Jefferson	Colorado	CORBIN FLATS	22-004	307.50
40	Deer Lodge	Orofino	CHAMPION	12-003	280.00
41	Park	New World	GOLD DUST	34-007	280.00
42	Cascade	Neihart	ROCHESTER	07-110	262.50
43	Broadwater	Hellgate	ARGO MINE AND MILLSITE	04-015	260.00
44	Cascade	Neihart	MOLTON	07-084	260.00
45	Jefferson	Basin	Old Basin Millsite	22-500	256.00
46	Beaverhead	Wisdom	MARTIN	01-270	240.00
47	Beaverhead	Hecla	True Blue	01-138	236.00

TABLE 4-4
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
SAFETY RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	SAFETY SCORE
48	Granite	South Boulder	NONPAREIL	20-012	235.00
49	Lewis & Clark	Marysville	BIG OX MILLSITE	25-115	224.40
50	Granite	Philipsburg	GRANITE MOUNTAIN	20-110	215.00
51	Powell	Elliston	GOLDEN ANCHOR	39-012	212.80
52	Beaverhead	Birch Creek	INDIAN QUEEN	01-034	210.00
53	Madison	South Boulder	MAMMOTH TAILINGS	29-082	202.50
54	Powell	Emery	EMERY	39-004	200.00
55	Cascade	Neihart	EVENING STAR MINE AND MILLSITE	07-087	196.00
56	Lewis & Clark	Rimini	BEATRICE	25-103	193.80
57	Broadwater	Confederate	MILLER	04-138	190.00
58	Madison	Tidal Wave	DRY GULCH (SOUTH)	29-282	190.00
59	Granite	Dunkleburg	FOREST ROSE	20-004	186.00
60	Broadwater	Indian Creek	DIAMOND HILL	04-020	161.25
61	Lewis & Clark	Rimini	ARMSTRONG MINE	25-102	152.50
62	Park	New World	MCLAREN MINE	34-010	151.50
63	Ravalli	Curlew	CURLEW	41-003	148.50
64	Cascade	Neihart	DACOTAH	07-121	147.00
65	Powell	Emery	HIDDEN HAND	39-502	145.60
66	Granite	Moose Lake	OLD DOMINION MINE	20-180	144.00
67	Jefferson	Colorado	ARGENTINE	22-102	140.00
68	Madison	Rochester	THISTLE MINE/TAILINGS	29-073	140.00
69	Powell	Elliston	LILY/ORPHAN BOY	39-006	140.00
70	Lewis & Clark	Marysville	BELMONT	25-167	136.50
71	Beaverhead	Elkhorn	OLD ELKHORN	01-169	130.00
72	Stillwater	Stillwater	BENBOW MILLSITE	48-005	125.00
73	Madison	Rochester	WATSECA	29-075	121.80
74	Jefferson	Elkhorn	Iron	22-359	118.50
75	Lewis & Clark	Helena	SPRING HILL TAILINGS	25-067	115.00
76	Fergus	Warm Springs	CUMBERLAND	14-017	113.75
77	Madison	Washington	MISSOURI	29-373	112.50
78	Madison	Sheridan	GOLDSCHMIDT/STEINER	29-078	112.00
79	Broadwater	Winston	Sunrise/January	04-130	108.90
80	Gallatin	Bozeman	KARST ASBESTOS	16-018	108.00
81	Jefferson	Clancy	NELLIE GRANT	22-244	108.00
82	Cascade	Neihart	Broadwater	07-079	104.00
83	Meagher	Beaver Creek	BIGLER MINE	30-067	102.00
84	Madison	Sheridan	SMUGGLER	29-010	101.00
85	Silver Bow	Basin Creek	HIGHLAND	47-028	100.00
86	Cascade	Neihart	SILVER BELT	07-111	96.00
87	Cascade	Neihart	Emma	07-144	94.60
88	Madison	Virginia City	Belle Mine	29-098	92.80
89	Granite	Philipsburg	RUMSEY	20-018	91.80
90	Lewis & Clark	Rimini	RED MOUNTAIN	25-019	91.00
91	Beaverhead	Bannack	APEX MILLSITE	01-006	90.90
92	Granite	Maxville	AXVILLE TAILINGS/LONDONDERR	20-209	88.80
93	Jefferson	Alhambra	MIDDLE FORK WARM SPRINGS	22-046	86.70
94	Madison	Pony	Garnet Gold	29-035	85.00

TABLE 4-4
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
SAFETY RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular, 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	SAFETY SCORE
95	Silver Bow	Elk Park	RISING SUN	47-037	85.00
96	Lewis & Clark	Marysville	BALD BUTTE MILLSITE	25-179	80.00
97	Jefferson	Elkhorn	TACOMA	22-284	77.00
98	Powell	Emery	EMMA DARLING	39-027	76.80
99	Powell	Elliston	SURE THING	39-020	76.50
100	Lewis & Clark	Stemple	NE NW SECTION 13	25-197	75.00
101	Missoula	Ninemile	JOE WALLIT MINE	32-010	75.00
102	Sanders	Plains	S & H	45-017	75.00
103	Cascade	Neihart	Hartley	07-082	72.00
104	Cascade	Neihart	SILVER DYKE MILL	07-138	70.40
105	Powell	Emery	BONANZA	39-501	67.20
106	Deer Lodge	Silver Lake	SILVER LAKE MILLSITE	12-070	62.00
107	Jefferson	Elkhorn	ELKHORN QUEEN	22-027	61.00
108	Park	New World	UPPER ALICE E.	34-085	60.00
109	Jefferson	Cataract	Cresent/Alsace	22-106	59.40
110	Lewis & Clark	Marysville	EMPIRE MILLSITE	25-175	58.80
111	Judith Basin	Hughesville	NE SE S7 / LUCKY STRIKE	23-042	56.00
112	Jefferson	Colorado	Crawley Camp	22-028	55.20
113	Madison	Sheridan	BROADGAUGE MINE	29-293	55.00
114	Sanders	Plains	MONTR0 GOLD	45-010	55.00
115	Mineral	Cedar Creek	NANCY LEE MILLSITE - SLOWEY	31-090	54.60
116	Missoula	Ninemile	NUGGET MINE	32-042	53.00
117	Jefferson	Basin	Doris	22-293	51.60
118	Madison	Pony	BOSS TWEED	29-034	51.50
119	Granite	Frog Pond	Millers Mine	20-176	50.40
120	Jefferson	Colorado	WASHINGTON	22-007	50.40
121	Lewis & Clark	Marysville	GOLDSIL MILLSITE	25-365	48.45
122	Ravalli	Pleasant View	BLUEBIRD	41-009	48.13
123	Beaverhead	Bannack	GOLD LEAF/ PRISCILLA	01-031	46.00
124	Cascade	Neihart	SILVER DYKE TAILINGS	07-137	45.00
125	Judith Basin	Hughesville	SINCLAIR	23-501	45.00
126	Powell	Elliston	KIMBALL	39-018	44.80
127	Cascade	Neihart	HAYSTACK CREEK	07-179	44.00
128	Judith Basin	Hughesville	M.T.A	23-040	42.00
129	Madison	Pony	ATLANTIC/PACIFIC	29-033	41.80
130	Lewis & Clark	Marysville	PIEGAN GLOSTER MILL	25-172	40.80
131	Jefferson	Elkhorn	SOURDOUGH	22-336	40.50
132	Fergus	Warm Springs	Prester John	14-090	40.00
133	Madison	South Boulder	MAMMOTH	29-008	40.00
134	Lewis & Clark	Rimini	Monte Cristo	25-275	38.50
135	Fergus	Warm Springs	TAIL HOLT	14-010	38.00
136	Powell	Elliston	HARD LUCK MINE	39-014	38.00
137	Cascade	Neihart	SILVER DYKE ADIT	07-135	37.50
138	Beaverhead	Lost Creek	TUNGSTEN MILLSITE	01-170	35.00
139	Lewis & Clark	Rimini	TENMILE MINE	25-005	35.00
140	Missoula	Clinton	Wallace Creek Mill	32-019	35.00
141	Jefferson	Cataract	EVA MAY	22-075	33.60

TABLE 4-4
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
SAFETY RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	SAFETY SCORE
142	Broadwater	Winston	EAST PACIFIC	04-008	33.55
143	Madison	Sheridan	SE SW SECTION 26	29-474	33.00
144	Jefferson	Colorado	WICKES SMELTER	22-358	32.00
145	Granite	Antelope Creek	SILVER KING	20-186	31.20
146	Granite	Combination	<i>SUNRISE/QUEEN MILLSITE</i>	20-036	30.80
147	Powell	Elliston	MONARCH	39-008	30.25
148	Stillwater	Nye	MOUAT MINE	48-001	30.25
149	Cascade	Neihart	MAUD S.	07-129	30.00
150	Judith Basin	Hughesville	Danny T.	23-500	30.00
151	Lincoln	Libby	SNOWSHOE MINE	27-005	30.00
152	Madison	Virginia City	KEARSAGE MINE	29-102	30.00
153	Park	New World	FISHER CREEK NO.1	34-090	30.00
154	Silver Bow	Elk Park	MARY EMMEE/CLINTON	47-035	30.00
155	Cascade	Neihart	SHERMAN NO. 2 (SOUTHWEST)	07-142	28.80
156	Deer Lodge	Silver Lake	GOLD COIN	12-004	28.50
157	Meagher	Smith River	SW NE S10	30-078	28.05
158	Lewis & Clark	Rimini	UPPER VALLEY FORGE	25-280	27.50
159	Missoula	Cramer Creek	LINTON MINE AND MILLSITE	32-017	27.20
160	Broadwater	Indian Creek	Bullion King	04-081	27.00
161	Jefferson	Basin	Lady Leith (NE NW S6)	22-316	26.00
162	Granite	Philipsburg	<i>DOUGLAS CREEK WASTE ROCK</i>	20-503	24.60
163	Cascade	Neihart	<i>LUCKY STRIKE</i>	07-169	23.70
164	Broadwater	Winston	Kleinschmidt	04-010	23.50
165	Lewis & Clark	Stemple	SWANSEA TAILINGS/MINE	25-208	23.10
166	Cascade	Neihart	Ripple Mines	07-163	23.00
167	Lewis & Clark	Rimini	Woodrow Wilson	25-258	22.80
168	Madison	Norris/Red Bluff	BOAZ MINE	29-013	21.00
169	Jefferson	Catact	Boulder Chief	22-132	20.25
170	Jefferson	Elkhorn	Elkhorn Creek Tailings	22-502	20.00
171	Madison	Norris/Red Bluff	GRUBSTAKE	29-399	20.00
172	Judith Basin	Hughesville	<i>CARTER</i>	23-019	19.80
173	Fergus	Warm Springs	Gilt Edge Tailings	14-008	19.20
174	Judith Basin	Hughesville	HARRISON	23-056	19.00
175	Jefferson	Basin	<i>BULLION SMELTER</i>	22-505	18.40
176	Cascade	Neihart	STALLABRASS	07-120	18.00
177	Lewis & Clark	Rimini	Peerless Jenny/King	25-006	17.60
178	Lewis & Clark	Rimini	National Extension	25-287	16.50
179	Powell	Elliston	TELEGRAPH	39-023	15.50
180	Missoula	Copper Cliff	Copper Cliff	32-001	13.80
181	Lewis & Clark	Lincoln	BLACKFOOT TAILINGS	25-322	12.00
182	Judith Basin	Hughesville	EDWARDS	23-046	10.00
183	Powell	Elliston	MOUNTAIN VIEW	39-062	10.00
184	Sanders	White Pine	JACK WAITE	45-002	10.00
185	Broadwater	Indian Creek	ST. LOUIS	04-013	8.85
186	Lewis & Clark	Lincoln	SEVEN-UP PETE	25-020	8.70
187	Broadwater	Winston	Custer Millsite	04-006	8.25
188	Beaverhead	Hecla	TRAPPER	01-144	8.00

TABLE 4-4
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
SAFETY RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	SAFETY SCORE
189	Silver Bow	Moose Creek	MIDDLE FORK MILLSITE	47-081	8.00
190	Jefferson	Clancy	<i>FROHNER</i>	22-243	7.80
191	Missoula	Woodman	WARD LODE MINE	32-005	7.50
192	Powell	Elliston	CHARTER OAK	39-003	7.50
193	Cascade	Neihart	<i>IXL/EUREKA</i>	07-083	7.40
194	Broadwater	Winston	Golden Age	04-050	7.30
195	Granite	Alps	ALPS	20-065	7.20
196	Cascade	Neihart	<i>CORNUCOPIA</i>	07-147	6.90
197	Powell	Elliston	JULIA	39-022	6.50
198	Missoula	Ninemile	LOST CABIN MINE	32-011	6.40
199	Madison	Virginia City	APEX	29-105	5.00
200	Meagher	Castle Mountain	BELLE OF THE CASTLES	30-007	5.00
201	Madison	Virginia City	PACIFIC	29-118	4.50
202	Cascade	Neihart	Lexington	07-167	4.00
203	Jefferson	Cataract	Rocker/Ada	22-170	3.60
204	Powell	Elliston	ANNA P. / HATTIE M.	39-044	3.60
205	Lewis & Clark	Stemple	Jay Gould Mine/Mill	25-500	3.10
206	Ravalli	Frog Pond	MONTANA PRINCE	41-004	3.00
207	Madison	Sheridan	RED PINE	29-079	2.80
208	Broadwater	Winston	Chartam	04-501	2.65
209	Cascade	Neihart	<i>LOWER BLACK DIAMOND JAY</i>	07-174	2.55
210	Jefferson	Basin	Josephine	22-031	2.55
211	Granite	Dunkleburg	WASA	20-023	2.50
212	Lewis & Clark	Rimini	Queensbury	25-262	2.40
213	Cascade	Neihart	<i>BENTON/BIG SNOWY</i>	07-151	1.90
214	Judith Basin	Hughesville	<i>BELFONT</i>	23-060	1.25
215	Granite	Alps	Argo	20-081	1.00
216	Park	Big Timber Canyon	<i>STEMWINDER SOUTH</i>	34-500	1.00
217	Cascade	Hughesville	BON TON	07-094	0.80
218	Cascade	Neihart	Rebellion Upper & Lower	07-157	0.80
219	Lewis & Clark	Stemple	ASTOR	25-227	0.80
220	Judith Basin	Hughesville	TIGER	23-059	0.75
221	Lewis & Clark	Rimini	Monitor Creek Tailings	25-503	0.75
222	Jefferson	Colorado	BERTHA	22-002	0.60
223	Jefferson	Alhambra	SOLAR SILVER	22-054	0.50
224	Mineral	Keystone	NANCY LEE MINE	31-001	0.50
225	Judith Basin	Hughesville	MOULTON	23-058	0.45
226	Beaverhead	Hecla	SILVER KING	01-094	0.00
227	Beaverhead	Wisdom	CLARA	01-262	0.00
228	Broadwater	Radersburg	KEATING TAILINGS	04-121	0.00
229	Cascade	Hughesville	BLOCK P TAILINGS	07-090	0.00
230	Cascade	Neihart	CARPENTER CREEK TAILINGS	07-103	0.00
231	Cascade	Neihart	FAIRPLAY	07-112	0.00
232	Cascade	Neihart	NEIHART TAILINGS	07-134	0.00
233	Cascade	Neihart	BIG SEVEN MINE	07-156	0.00
234	Flathead	Hog Heaven	FLATHEAD MINE COMPLEX	15-012	0.00
235	Granite	Philipsburg	BI-METALLIC/OLD RED	20-002	0.00

TABLE 4-4
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
SAFETY RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	SAFETY SCORE
236	Granite	Combination	COMBINATION MILL	20-009	0.00
237	Granite	Combination	COMBINATION II	20-009A	0.00
238	Granite	South Boulder	PORT ROYAL MILL TAILINGS	20-016	0.00
239	Granite	Dunkleburg	JACKSON PARK	20-027	0.00
240	Granite	Antelope Creek	ANT	20-194	0.00
241	Jefferson	Colorado	BLUEBIRD	22-003	0.00
242	Jefferson	Colorado	GREGORY	22-005	0.00
243	Jefferson	Cataract	MANTLE EAST	22-032	0.00
244	Jefferson	Basin	BASIN MILLSITE	22-036	0.00
245	Jefferson	Basin	BUCKEYE	22-072	0.00
246	Jefferson	Cataract	CRYSTAL MINE	22-073	0.00
247	Jefferson	Basin	ENTERPRISE	22-074	0.00
248	Jefferson	Elkhorn	QUEEN/TOURMALINE QUEEN	22-111	0.00
249	Jefferson	Clancy	GENERAL GRANT	22-245	0.00
250	Jefferson	Basin	JACK CREEK TAILINGS	22-296	0.00
251	Jefferson	Elkhorn	Trumley Heap Leach	22-501	0.00
252	Judith Basin	Hughesville	BELT PATENT MINE/TAILINGS	23-035	0.00
253	Judith Basin	Hughesville	WRIGHT LODGE	23-045	0.00
254	Judith Basin	Hughesville	MAY AND EDNA	23-502	0.00
255	Lewis & Clark	Rimini	VALLEY FORGE/SUSIE	25-008	0.00
256	Lewis & Clark	Rimini	LOWER TENMILE MILL	25-030	0.00
257	Lewis & Clark	Marysville	BIG OX MINE	25-116	0.00
258	Lewis & Clark	Stemple	SE SW SECTION 10	25-212	0.00
259	Lewis & Clark	Rimini	Peter	25-259	0.00
260	Lewis & Clark	Marysville	WILD CAT	25-317	0.00
261	Lewis & Clark	Helena	Joslyn Street Tailings	25-501	0.00
262	Lewis & Clark	Rimini	Bear Gulch Mine	25-504	0.00
263	Lincoln	Libby	CHERRY CREEK MILL	27-006	0.00
264	Madison	Rochester	EMMA	29-061	0.00
265	Madison	Tidal Wave	B & H	29-083	0.00
266	Madison	Virginia City	EASTON	29-121	0.00
267	Madison	Sheridan	LATEST OUT	29-354	0.00
268	Madison	Sheridan	UNCLE SAM	29-383	0.00
269	Madison	Washington	SE SE SECTION 25	29-394	0.00
270	Madison	Sheridan	LAKESHORE MINE	29-436	0.00
271	Madison	Sheridan	NW SE SECTION 26	29-476	0.00
272	Madison	Pony	CMC Pony Mill	29-500	0.00
273	Mineral	Packer Creek	TARBOX-MINERAL KING	31-003	0.00
274	Mineral	Iron Mountain	IRON MOUNTAIN MILLSITE	31-010	0.00
275	Mineral	Packer Creek	SALTESE CONSOLIDATE	31-021	0.00
276	Mineral	Iron Mountain	BELLE OF THE HILLS	31-072	0.00
277	Mineral	Iron Mountain	DILLON MILLSITE	31-073	0.00
278	Mineral	Keystone	LITTLE ANACONDA MINE	31-077	0.00
279	Mineral	Keystone	NANCY LEE MILLSITE	31-082	0.00
280	Missoula	Copper Cliff	Frogs Diner	32-027	0.00
281	Park	New World	Great Republic Smelter	34-000	0.00
282	Park	New World	MCLAREN TAILINGS	34-004	0.00

TABLE 4-4
1993, 1994, & 1995 ABANDONED HARDROCK MINES PRIORITY SITES
SAFETY RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	SAFETY SCORE
283	Park	New World	LITTLE DAISY	34-009	0.00
284	Park	Emigrant	ALLISON	34-018	0.00
285	Park	New World	BLACK WARRIOR	34-079	0.00
286	Powell	Elliston	ONTARIO MILLSITE	39-010	0.00
287	Powell	Elliston	THIRD TERM	39-024	0.00
288	Powell	Emery	<i>SPRING CREEK TAILINGS</i>	39-503	0.00
289	Sanders	Blue Creek	BROKEN HILL	45-005	0.00
290	Sanders	Trout Creek	HOLLIDAY MINE	45-009	0.00
291	Silver Bow	Melrose	OLD GLORY	47-027	0.00
292	Silver Bow	Melrose	CLIPPER	47-029	0.00

TABLE 4-5
1993, 1994, & 1995 ABANDONED HARDROCK MINES DROPPED SITES
SORTED BY AIMSS RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular, 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	AIMSS SCORE	SAFETY SCORE
293	Broadwater	Winston	VOSBURG - RECLAIMED	04-014	0.0035	0.00
294	Granite	South Boulder	BROOKLYN - RECLAIMED	20-025	0.0322	0.02
295	Cascade	Neihart	VILIPA	07-080	0.04	436.80
296	Mineral	Keystone	HOPKINS	31-078	0.04	30.80
297	Broadwater	Confederate	HUMMINGBIRD	04-144	0.03	0.00
298	Cascade	Neihart	BAKER MINE	07-180	0.03	12.00
299	Lewis & Clark	Stemple	New Jay Gould Mill	25-502	0.03	44.00
300	Madison	Virginia City	GENERAL SHAFTER	29-103	0.03	0.00
301	Park	Big Timber Canyon	KELLY	34-113	0.03	1.00
302	Powell	Elliston	VIKING	39-077	0.03	1.25
303	Beaverhead	Lemhi Pass	LAST CHANCE NO. 1/IER	01-216	0.02	0.00
304	Beaverhead	Lemhi Pass	LAST CHANCE #2/IER	01-220	0.02	0.00
305	Cascade	Neihart	Snow Creek Mill	07-505	0.02	1.60
306	Mineral	Keystone	KEYSTONE	31-074	0.02	51.00
307	Missoula	Woodman	UPPER TRIANTLER	32-048	0.02	102.00
308	Sanders	Plains	DEE CREEK MINE	45-041	0.02	50.00
309	Beaverhead	Lemhi Pass	OUTH FRYING PAN CREEK MIN	01-211	0.01	0.00
310	Cascade	Neihart	ONTARIO	07-148	0.01	1.15
311	Cascade	Neihart	Hutchinson	07-177	0.01	0.00
312	Gallatin	Bozeman	ELK CREEK CORUNDUM	16-013	0.01	15.40
313	Granite	Antelope Creek	LORI NO. 13	20-191	0.01	0.00
314	Jefferson	Basin	MARGUERITE	22-301	0.01	10.00
315	Madison	Norwegian	NORWEGIAN	29-006	0.01	4.80
316	Madison	Tidal Wave	ELEANOR MINES (EAST)	29-285	0.01	0.00
317	Madison	Tidal Wave	PETE & JOE	29-449	0.01	0.00
318	Meagher	Beaver Creek	LANE	30-019	0.01	0.00
319	Mineral	Cedar Creek	CAJUN QUEEN NO. 1	31-049	0.01	0.00
320	Missoula	Elk Creek	MORSE & KENNEDY	32-033	0.01	3.00
321	Missoula	Ninemile	HAUTILLA	32-057	0.01	20.40
322	Jefferson	Basin	PERRY'S PARK	22-039	0.005	0.00
323	Cascade	Neihart	ATLANTUS	07-113	0.004	60.00
324	Judith Basin	Yogo	NE NE S31	23-079	0.004	0.00
325	Park	New World	HOMESTAKE NO. 2	34-093	0.004	410.00
326	Lewis & Clark	Helena	DAVIS GULCH II	25-040	0.003	65.00
327	Madison	Sheridan	PEDRO MINE	29-455	0.003	0.00
328	Lewis & Clark	Helena	LADY LUCK	25-073	0.002	50.00
329	Fergus	Warm Springs	Western Mine/Mill	14-023	0.002	36.00
330	Meagher	Beaver Creek	SE NW SEC. 24	30-017	0.002	132.00
331	Madison	Tidal Wave	OHIO	29-473	0.002	0.00
332	Ravalli	Hughes Creek	LUCKY JOE	41-027	0.001	43.75
333	Gallatin	Bozeman	THUMPER MICA	16-015	0.001	200.00
334	Mineral	St. Regis	Gold Chrome	31-037	0.001	0.00
335	Sweet Grass	Independence	POORMAN/EMMA	49-001	0.0005	36.00
336	Meagher	Beaver Creek	PORCUPINE	30-069	0.0004	53.00
337	Judith Basin	Yogo	VORTEX	23-027	0.0003	0.00
338	Beaverhead	Lemhi Pass	Thorium City	01-500	0.0003	0.00
339	Madison	Virginia City	JTC	29-106	0.0002	2.50

TABLE 4-5
1993, 1994, & 1995 ABANDONED HARDROCK MINES DROPPED SITES
SORTED BY AIMSS RANKING

(SITE NAME: 1993 = CAPITALS ; 1994 = Regular; 1995 = ITALICS)

AIMSS RANK	County	District	Site Name	PA #	AIMSS SCORE	SAFETY SCORE
340	Beaverhead	Baldy Mountain	GARRETT HILL	01-092	0.0002	0.00
341	Sweet Grass	Independence	NW SE S22	49-003	0.0002	0.00
342	Missoula	Woodman	MILL CREEK MINE	32-049	0.0001	2.50
343	Lincoln	Libby	MITCHELL CREEK	27-055	0.0001	20.00
344	Powell	Ophir	NE NW SEC. 32	39-052	0.0001	175.00
345	Lewis & Clark	Stemple	PANGEWASSET	25-226	0.00001	1.25
346	Cascade	Neihart	SHERMAN NO. 2 (NORTHEAST)	07-140	0.00	6.00
347	Deer Lodge	Silver Lake	CABLE	12-002	0.00	0.00
348	Lewis & Clark	Rimini	SE SE S13	25-294	0.00	0.00
349	Lewis & Clark	Marysville	ARGO MILLSITE	25-314	0.00	20.40
350	Lewis & Clark	Helena	MOTHER LODE	25-363	0.00	0.00
351	Lincoln	Libby	SILVER CABLE	27-066	0.00	0.00
352	Mineral	Iron Mountain	GOLD KING	31-067	0.00	0.00
353	Silver Bow	Melrose	MAIDEN ROCK	47-051	0.00	4.20

5.0 SITE SUMMARY FORMS

The following section presents a one page summary sheet for each of the 25 sites investigated during the 1995 inventory. Each summary sheet provides the site name, location, and other geographic information; and investigation details and summary of findings. Analytical data obtained at each site is summarized on the back of each summary sheet. Summary sheets for the 328 sites investigated in 1993 and 1994 are located in a previous report (MDEQ/AMRB-Pioneer, 1995).

SAMPLE DESIGNATION LEGEND

GW: Groundwater sample from well, spring, shaft, or adit discharge.

SW: Surface water sample from stream, river, or ditch.

AD: Adit discharge.

SE: Stream sediment sample.

TP: Mill tailings sample from tailings pond or pile, or streamside tailings deposit.

WR: Waste rock sample from waste rock dump.

SS: Background soil sample.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>IXL/Eureka</u> Legal Description: T <u>14N</u> R <u>8E</u> Mining District: <u>Neihart</u> Latitude: <u>N 46° 57' 18"</u> Longitude: <u>W 110° 42' 43"</u> Land Status: <u>Private</u> Quad: <u>Neihart</u> Inspectors: <u>Tuesday, Flammang, Sampson</u> Organization: <u>Pioneer Technical Services, Inc.</u>	County: <u>Cascade</u> Section(s): <u>NW 1/4, NE 1/4, Section 28</u> Mine Type: <u>Hardrock/Ag, Pb, Zn</u> Primary Drainage: <u>Belt Creek</u> USGS Code: <u>10030105</u> Secondary Drainage: <u>Snow Creek/Carpenter Creek</u> Date Investigated: <u>September 24, 1995</u> P.A. # <u>07-083</u>
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- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 3,575 cubic yards. WR-3 was situated in an intermittent stream bed. The following elements were elevated at least three times background:

Antimony: 68.2J mg/kg	Arsenic: 36 to 97.7 mg/kg
Cadmium: 6.5J to 7J mg/kg	Copper: 33.4JX to 59.9 mg/kg
Iron: 83,700 mg/kg	Lead: 2,880 to 3,130 mg/kg
Mercury: 0.48 to 4.3 mg/kg	Silver: 27.6 to 45.2 mg/kg
Zinc: 581 to 1,590J mg/kg	

- One discharging adit was observed at the site which flowed over and along the west side of WR-3. No MCLs were exceeded in the adit water sample, but acute and chronic aquatic life criteria were exceeded for zinc, and the chronic aquatic life criteria was exceeded for aluminum, cadmium, and lead. The pH of the adit discharge was 6.38.

- No surface water flowed on or near the site during the investigation. The nearest flowing surface water was over 1,000 feet away; no surface water samples were collected.

- An observed release to the intermittent drainage (sediment) was documented for silver, which is directly attributable to the site.

- Potential safety hazards observed at the site included three open adits, one fenced open shaft, three shaft/subsidence structures, a highwall, and two unstable waste piles.

I.X.L./EUREKA (all 4 sites) PA# 07-083
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/24/95

		SOLID MATRIX ANALYSES																
		Metals in soils Results per dry weight basis																
FIELD ID		Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
07-083-SE-1		5.4 UJ	29.3 J	44.4	9.2	1590	15.6	7.2	72.6	38300	428 JX	3800 J	1660	0.055	12.8	8.8	1450	NR
07-083-SE-2		4.9 UJ	43.7 J	95.4	20.8	2680	17.5	12.2	55.2	25400	681 JX	7350 J	4250	0.049	27.4	1.1	2500	NR
07-083-WR-1		68.2 J	36.0	15.0	7.0 J	19.3	1.6 U	1.8 U	59.9	9810	2880	56.8	25.6	4.3	2.3 U	45.2	1590 J	NR
07-083-WR-3		6.3 UJ	97.7	16.6 J	6.5 J	35900	2.0 U	2.2 U	33.4 JX	83700	3130	46.2	12.5	0.48	2.8 U	27.6	581	NR
BACKGROUND		4.7 UJ	9.6	87.6	1.32 JX	NR	27.2 J	9.05 J	10.8 J	21100	52.4 JX	NR	708 J	0.04	10.3	0.5 B	135	NR
		U: Not Detected, J: Estimated Quantity, X: Outlier for Accuracy or Precision, NR: Not Requested																
		Acid/Base Accounting																
FIELD ID		TOTAL SULFUR %	Total Sulfur Acid Base (mg/kg)	Neutral Potent. (mg/kg)	Tot. Sulfur Acid Base Potential (mg/kg)	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	Pyritic Sulfur Acid Base (mg/kg)	Pyritic Sulfur Acid Base Potential (mg/kg)	Line Rec. Subst. (mg/kg)	Line Rec. Subst. (lbs./m)	Potential Acidity (mg/kg)	Line Rec. Sulfur (mg/kg)	Line Rec. Sulfur (lbs./m)			
07-083-WR-1		0.29	9.06	-1.33	-10.4	0.18	0.01	0.10	0.31	-1.64	-1.64	-3.44	7.66	-11.23	-23.99			
07-083-WR-3		9.09	284	-6.56	-291	0.15	1.62	7.32	50.6	-57.20	-57.20	-120.12	262.89	-361.61	-159.61			

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

		WATER MATRIX ANALYSES																	
		Metals in Water Results in ug/l																	
FIELD ID		Al (ug/L)	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Zn (ug/L)	HARDNESS (mg CaCO ₃ /L)	
07-083-AD-1		103 JX	2.7 UJ	1.2 U	4.8 U	1.1	18500	9.6 U	10.9 U	4.4 U	709	3.5	3700	99.4	0.16 U	17.7	0.21 U	340	615
		Wet Chemistry Results in mg/l																	
FIELD ID		Total Dissolved Solids	CHLORIDE	SULFATE	NO ₃ /NO ₂ -N	CYANIDE													
07-083-AD1		103	< 5	40.0	NR	NR													

Legend

SE-1: Immediately below WR-3.
SE-2: Upstream above WR-1 & WR-3.
WR-1: Composite WRI-A, 1B, 2A, 2B, 4A, 4B.
WR-2: Composite WRI-A, 1B, 2A, 2B, 4A, 4B.
BACKGROUND: From the Ripple (07-103-SS1) (1984 data).
AD-1: Add # WR-3.

U: Not Detected; J: Estimated Quantity; X: Outlier for Accuracy or Precision; NR: Not Requested

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

Legend

SE-1: Immediately below WR-3
SE-2: Upstream above WR-1 & WR-3
WR-1: Composite WRI A, 1B, 2A, 2B, 4A, 4B
WR-2: Composite WRI C, 5A, 5B, 5C
BACKGROUND: From the Ripple (07-103-SS1) (1994 data)
AD-1: Adit at WR-3

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Cornucopia</u>	County: <u>Cascade</u>
Legal Description: T <u>14N</u> R <u>8E</u>	Section(s): <u>SW 1/4, SE 1/4, Section 22</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 46° 57' 17"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 41' 27"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Snow Creek/Carpenter Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>September 25, 1995</u>
Inspectors: <u>Tuesday, Flammang</u>	P.A. # <u>07-147</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.
- The volume of waste rock observed at the site was approximately 8,475 cubic yards. Waste rock was located in a drainage. The following elements were elevated at least three times background:

Arsenic: 58.9 to 184 mg/kg	Lead: 194 to 723 mg/kg
Mercury: 0.22 to 0.33 mg/kg	Silver: 4.6 to 58.8 mg/kg
Zinc: 559 mg/kg	
- One discharging adit was observed at the site which flowed over and through WR-2. Field parameters were taken with a pH of 7.99. A previously collected sample of the discharge exceeded acute and chronic aquatic life criteria for copper and zinc, and the sample exceeded chronic aquatic life criteria for lead and iron.
- An intermittent unnamed tributary to Snow Creek flowed adjacent and through WR-2 during the investigation. Acute and chronic aquatic life criteria were exceeded for zinc and cadmium, while lead exceeded the chronic aquatic life criteria. The MCL for cadmium was exceeded.
- An observed release to the tributary via sediment was documented for arsenic, lead, and silver.
- Potential safety hazards observed included two partially collapsed buildings, a large pit with collapsed shaft, a collapsed adit with a 25 foot highwall, and two unstable waste piles.

Cornucopia PA# 07-147
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/25/95

SOLID MATRIX ANALYSES

FIELD ID	Metals in soils Results per dry weight basis														CYANIDE (mg/Kg)	
	Sb (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Cs (mg/Kg)	Cr (mg/Kg)	Co (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Pb (mg/Kg)	Mg (mg/Kg)	Mn (mg/Kg)	Hg (mg/Kg)	Ni (mg/Kg)	Ag (mg/Kg)	Zn (mg/Kg)
07-147-SE-1	5.4 UJ	5.77	46.1 J	1.4 J	2570	160	12.4	15.5 JX	23000	30.0	4860	492	0.043 U	14.7	0.8 U	102
07-147-SE-2	6.3 UJ	35.8	57.8 J	2.3 J	2370.0	89	6.8	17.5 JX	20300	124	1980	365	0.050 U	6.7	8.0	228
07-147-WR-1	5.9 UJ	184	78.2 J	3.1 J	947	5.2	4.3	28.4 JX	49600	723	1890	163	0.33	5.4	58.8	559
07-147-WR-2	5.7 UJ	58.9	53.0 J	2.2 J	2460	11.7	5.0	25.9 JX	23900	194	1770	278	0.22	8.2	4.6	217
BACKGROUND	4.7 UJ	9.6	87.6	1.32 JX	NR	27.2 J	9.05 J	10.8 J	21100	52.4 JX	NR	708 J	0.04	10.3	0.5 B	135

U: Not Detected; J: Estimated Quantity; X: Outlier for Accuracy or Precision; NR: Not Requested

AcidBase Accounting

FIELD ID	Total Sulfur				Pyritic Sulfur				Pyritic Sulfur				Lime Req.				Line Req.			
	TOTAL Sulfur %	AcidBase Potential	AcidBase Potential	%	Tot. Sulfur	AcidBase Potential	AcidBase Potential	%	Pyritic Sulfur	AcidBase Potential	AcidBase Potential	%	Lime Req. (lbs./T)	Sobek (lbs./T)	Potential Acidity	Dolhoff (gross)	Line Req. Dolhoff (gross)	Dolhoff (lbs./T)	Line Req. Dolhoff (gross)	Line Req. Dolhoff (lbs./T)
07-147-WR-1	0.26	8.12	-3.88	0.24	-12.0	0.24	-12.0	0.02	0.00	-3.88	-3.88	-8.15	6.25	-12.66	-12.66	-12.66	-12.66	-26.59	-26.59	-26.59
07-147-WR-2	0.10	3.12	1.37	0.05	-1.76	0.05	-1.76	-0.01	1.56	-0.19	-0.19	-0.19	-0.40	-0.40	2.73	-1.71	-1.71	-3.58	-3.58	-3.58

WATER MATRIX ANALYSES

FIELD ID	Metals in Water Results in ug/l														HARDNESS (mg CaCO3/L)	
	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)
07-147-SW-1	2.7 U	1.8 U	24.2	7.5	22700	9.6 U	10.9 U	4.4 U	29.2	1.8 JX	7780	18.0 J	0.16 U	13.9 U	0.21 UJX	2450
07-147-SW-2	2.7 U	2.0	11.8	4.4	11700	9.6 U	10.9 U	4.4 U	32.8	2.2 JX	3800	5.2 UJ	0.16 U	13.9 U	0.45 JX	1150
CC-GW-7	45.9 U	2.3 U	12	3.1 U	14800	2.8 U	4.3 U	16.4	1290.0	11.7	4620	111	0.1 U	14.2 U	2.20 U	107

U: Not Detected; J: Estimated Quantity; X: Outlier for Accuracy or Precision; NR: Not Requested

**Wet Chemistry
Results in mg/l**

FIELD ID	Total Dissolved Solids	CHLORIDE		SULFATE		NO3/NO2-N		CYANIDE	
07-147-SW-1	98	<	5		77		NR		NR
07-147-SW-2	46	<	5		36		NR		NR

Legend

SE-1: 20' below road.
 SE-2: 175' below base of WR2 where stream reappears.
 WR-1: Composite WR1A, 1B, 1C.
 WR-2: Composite WR2A, 2B, 2C.
 BACKGROUND: From the Ripple (07-163-SS) (1994 data).
 SW-1: Same as SE-1.
 SW-2: Same as SE-2.
 CC-GW-7: Adult discharge (GW1 on sketch)

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Ontario</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>NW 1/4, NE 1/4, Section 27</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 46° 57' 00"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 41' 32"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Snow Creek/Carpenter Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>September 25, 1995</u>
Inspectors: <u>Tuesday, Flammang</u>	P.A. # <u>07-148</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.

- The volume of waste rock observed at the site was approximately 975 cubic yards. The waste rock was adjacent to the adit discharge. The following elements were elevated at least three times background:

Arsenic: 145 mg/kg	Cadmium: 13J mg/kg
Copper: 35.4JX mg/kg	Lead: 347 mg/kg
Manganese: 3,090 mg/kg	Mercury: 0.15 mg/kg
Zinc: 948 mg/kg	

- One discharging adit was observed at the site which flowed adjacent to the waste rock. No MCLs or chronic aquatic life criteria were exceeded; however, the acute aquatic life criteria was exceeded for silver. The pH was 6.5.

- No surface water flowed on or near the site during the investigation. The nearest surface water was over 1,000 feet away; no surface water samples were collected.

- Potential safety hazards observed included a small shed and highwall at the caved adit.

Ontario PA# 07-148
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/25/95

SOLID MATRIX ANALYSES

FIELD ID	Metals in soils Results per dry weight basis																	CYANIDE (mg/kg)
	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)		
07-148-WR-1	6.9 UJ	1.45	59.6 J	13.0 J	6380	19.1	25.5	35.4 JX	42100	347	2820	3090	0.15	52.9	1.2	948	NR	
BACKGROUND	4.7 UJ	9.6	87.6	1.32 JX	NR	27.2 J	9.05 J	10.8 J	21100	52.4 JX	NR	708 J	0.04	10.3	0.5 B	135	NR	
U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested																		
Acid/Base Accounting																		
FIELD ID	Total Sulfur			Pyritic Sulfur			Pyritic Sulfur			Lime Req. Dolphop			Lime Req. Dolphop			Lime Req. Dolphop		
	Neutral Potent. Sulfate	Acid Base Potential	%	Sulfate Sulfur	%	%	Organic Sulfur	Acid Base Potential	%	Sulfur Sulfate	Acid Base Potential	%	Potential Sulfate	Sobek Titration	%	Potential Sulfate	Sobek Titration	
07-148-WR-1	0.49	15.3	14.0	-1.33	0.03	0.20	0.26	6.25	7.73	7.73	16.23	15.08	-1.35	-2.83	-2.83	-2.83	-2.83	

WATER MATRIX ANALYSES

FIELD ID	Metals in Water Results in ug/L														HARDNESS (mg CaCO ₃ /L)		
	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)		Ag (ug/L)	Zn (ug/L)
07-148-AD-1	2.7 U	1.8 U	7.0	0.10	8360	9.6 U	10.9 U	4.4 U	139	1.3 UX	2540	19.1 J	0.16 U	13.9 U	1.4 JX	7.6 U	31.3
Wet Chemistry Results in mg/L																	
FIELD ID	Total Dissolved Solids			CHLORIDE		SULFATE		NORM2-N		CYANIDE							
	12	<	5	<	5	<	5	<	5	<	5	<	5	<	5	<	5
07-148-AD-1	12	<	5	<	5	<	5	<	5	<	5	<	5	<	5	<	5

Legend

WR-1: Composite WR(A and WR(B)
BACKGROUND: From the RipRap (07-163-SST) (1994 data).
AD-1: Adit discharge above road and WR1.

U- Not Detected; J- Estimated Quantity; X- Outlier for Accuracy or Precision; NR- Not Requested

Legend
WR-1: Composite WRIA and WRIB.
BACKGROUND: From the Ripple (07-163-SS1) (1994 data).
AD-1: Adl. discharge above road and WR1.

U: Not Detected; J: Estimated Quantity; X: Outlier for Accuracy or Precision; NR: Not Requested

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Benton/Big Snowy</u>	County: <u>Cascade</u>
Legal Description: T <u>14N</u> R <u>8E</u>	Section(s): <u>SW 1/4, NW 1/4, Section 27</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Pb, Ag, Au</u>
Latitude: <u>N 46° 56' 44"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 42' 04"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Snow Creek/Carpenter Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>September 25, 1995</u>
Inspectors: <u>Tuesday, Flammang</u>	P.A. # <u>07-151</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.
- The volume of waste rock associated with the site was approximately 9,250 cubic yards. Waste rock was situated in a intermittent drainage. The following elements were elevated at least three times background:

Antimony: 22.1 to 28.9 mg/kg	Arsenic: 95.4 to 160 mg/kg
Cadmium: 22.6J mg/kg	Lead: 3,210 to 3,560 mg/kg
Copper: 65.6 to 169 mg/kg	Silver: 50.7 to 60.4 mg/kg
Mercury: 0.36 to 0.48 mg/kg	Zinc: 5,000J mg/kg
- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation.
- No surface water flowed on or near the site during the investigation. The nearest flowing surface water was over 1,000 feet away; no surface water samples were collected.
- Observed releases to the intermittent drainage (sediment) were documented for cadmium and zinc, which were directly attributable to the site.
- Potential safety hazards observed at the site included a small wood building and two unstable collapsed adit trenches.

**Benton/ Big Snowy (2 sites) PA# 07-151
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/25/95**

SOLID MATRIX ANALYSES

Results in soils
Results per dry weight basis

FIELD ID	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
07-151-SE-1	9.8 J	99.6	68.9	12.4 J	2030	8.0	5.5	57.8	27600	1650	2690	833	0.14	5.9	28.3	2810 J	NR
07-151-SE-2	6.8 UJ	110	423	2.1 J	1450	14.7	4.9	136	26100	2080	3650	558	0.38	8.6	58.2	596 J	NR
07-151-WR-1	28.9 J	95.4	16.9	22.6 J	184	3.0	1.7 U	65.6	15300	3210	314	69	0.48	2.2 U	50.7	5000 J	NR
07-151-WR-3	22.1 J	160	69.1	1.7 J	2470	4.8	2.0 U	169	26700	3560	684	91.3	0.36	2.9	60.4	361 J	NR
BACKGROUND	4.7 UJ	9.6	87.6	1.32 JX	NR	27.2 J	9.05 J	10.8 J	21100	52.4 JX	NR	708 J	0.04	10.3	0.5 B	135	NR

U: Not Detected, J: Estimated Quantity, X: Outlier for Accuracy or Precision, NR: Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	Total Sulfur Acid Base $\frac{\mu}{1000t}$	Neutral Potent. $\frac{\mu}{1000t}$	Tot. Sulfur Acid Base Potential $\frac{\mu}{1000t}$	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	Pyritic Sulfur Acid Base Potential $\frac{\mu}{1000t}$	Pyritic Sulfur Acid Base Potential $\frac{\mu}{1000t}$	Lime Req. Sobek $\frac{\mu}{1000t}$	Potential Acidity	Line Req. Dolphoff $\frac{\mu}{1000t}$	Line Req. Dolphoff $\frac{\mu}{1000t}$
07-151-WR-1	0.58	18.1	-1.53	-19.6	0.35	0.08	0.15	-4.03	-4.03	-8.46	15.39	-21.15	-44.42
07-151-WR-3	0.90	28.1	-21.82	-31.0	0.86	<0.01	0.04	-2.92	-2.92	-5.13	21.41	-54.16	-113.74

Legend

SE-1: Downstream of site, 50' below WR1.
SE-2: Streambank at site, 50' below WR1.
WR-1: Composite of WR1, 2A, 2B
WR-3: Composite of WR3A, WR3B.
BACKGROUND- From the Ripple (07-163-SS1) (1994 data).

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Lucky Strike</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>SE 1/4, NW 1/4, Section 28</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag. Pb. Zn</u>
Latitude: <u>N 46° 56' 57"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 42' 55"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Snow Creek/Carpenter Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>September 24, 1995</u>
Inspectors: <u>Tuesday, Flammang, Sampson</u>	P.A. # <u>07-169</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 2,400 cubic yards. Waste rock was in the direct path of the adit discharge. The following elements were elevated at least three times background:

Antimony: 32.1J mg/kg	Arsenic: 61.6 mg/kg
Cadmium: 6.2J mg/kg	Copper: 224 mg/kg
Lead: 954 mg/kg	Manganese: 3,000 mg/kg
Mercury: 0.94 mg/kg	Silver: 59.1 mg/kg
Zinc: 1,200J mg/kg	

- One discharging adit was observed at the site which flowed over and along the waste rock. Acute and chronic aquatic life criteria were exceeded for copper and zinc, and no MCLs were exceeded. The pH was 7.98.

- No surface water flowed on or near the site during the investigation. The nearest surface water was over 1,000 feet away; no surface water samples were collected.

- Potential safety hazards observed at the site included one partially open adit, a metal shed, two loadouts, and three highwalls.

Lucky Strike PA# 07-169
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/24/95

SOLID MATRIX ANALYSES

FIELD ID	Metals in soils Results per dry weight basis														CYANIDE (mg/kg)			
	Sh (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)		
07-169-WR-1	32.1 J	61.6	46.9	6.2 J	2230	11.5	11.2	224	37100	954	3070	3000	0.94	10.3	59.1	1200 J	NR	
BACKGROUND	4.7 UJ	9.6	87.6	1.32 JX	NR	27.2 J	9.05 J	10.8 J	21100	52.4 JX	NR	708 J	0.04	10.3	0.5 B	135	NR	
U = Not Detected, J = Estimated Quantity, X = Outlier for Accuracy or Precision, NR: Not Requested																		
FIELD ID	Acid/Base Accounting										Lime Req. Dolhopf (lbs/1000)		Lime Req. Dolhopf (lbs/1000)					
	TOTAL SULFUR %	Sulfur Acid Base Potential mV/dec	Sulfur Acid Base Potential mV/dec	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	Pyritic Sulfur Acid Base Potential mV/dec	Pyritic Sulfur Acid Base Potential mV/dec	Pyritic Sulfur Acid Base Potential mV/dec	Pyritic Sulfur Acid Base Potential mV/dec	Lime Req. Sobak (lbs/1000)	Potential Acidity (mV/dec)	Lime Req. Sobak (lbs/1000)	Lime Req. Dolhopf (lbs/1000)	Lime Req. Dolhopf (lbs/1000)			
07-169-WR-1	0.55	17.2	2.83	0.20	0.07	0.28	2.19	0.64	1.67	1.34	15.63	-15.59	-15.40	-32.33	-33.59			
07-169-WR-1 DUP	0.55	17.2	3.23	0.21	0.05	0.29	1.56	1.67	1.67	3.51	15.55	-15.40	-32.33	-32.33	-32.33			

U: Not Detected, J: Estimated Quantity, X: Outlier for Accuracy or Precision; NR: Not Requested

WATER MATRIX ANALYSES

FIELD ID	Metals in Water Results in ug/l														HARDNESS			
	Al (ug/L)	Sh (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)	(not Calc'd)
07-169-AD-1	172 JX	4.4 J	2.0	8.6	0.91	29900	10.7	10.9 U	21.3	665	6.8	10500	811	0.16 U	13.9 U	1.3	135	118
Wet Chemistry Results in mg/l																		
FIELD ID	Total Dissolved Solids				SULFATE				CHLORIDE				CYANIDE					
	NO3	NO2	NH	NO3+NO2+N	NO3	NO2	NH	NO3+NO2+N	NO3	NO2	NH	NO3+NO2+N	NO3	NO2	NH	NO3+NO2+N		
07-169-AD-1	159	<	5	51	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		

U: Not Detected, J: Estimated Quantity, X: Outlier for Accuracy or Precision; NR: Not Requested

Legend

WR-1: Composite of WR1A, 1B, 2A, 2B, 3
 BACKGROUND: From the Ripple (07-163-SST) (1994 data).
 AD-1: Adj. at WR-2.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Lower Black Diamond Jay</u>	County: <u>Cascade</u>
Legal Description: <u>T 14N R 8E</u>	Section(s): <u>SW 1/4, SW 1/4, Section 22</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 46° 57' 18"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 42' 00"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Snow Creek/Carpenter Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>September 27, 1995</u>
Inspectors: <u>Tuesday, Flammang, Liebelt</u>	P.A. # <u>07-174</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.
- The volume of waste rock associated with the site was approximately 1,875 cubic yards. Waste rock was located in the drainage of an unnamed tributary of Snow Creek. The following elements were elevated at least three times background:

Arsenic: 223 mg/kg	Copper: 66.2 mg/kg
Lead: 8,590 mg/kg	Mercury: 0.47 mg/kg
Silver: 12.9 mg/kg	Zinc: 644J mg/kg
- One discharging adit was observed at the site which flowed into the waste rock dump. Field parameters were taken with a pH of 8.01.
- Surface water flowed from an unnamed tributary of Snow Creek along the base of the waste rock dump. The chronic aquatic life criteria was exceeded for lead, while the acute aquatic life criteria was exceeded for silver in the upstream sample. No MCLs were exceeded.
- An observed release of silver to the unnamed tributary of Snow Creek (sediment) was documented, which is directly attributable to the site.
- Potential safety hazards observed at the site included two buildings and an open shaft on the ridge above the site.

Lower Black Diamond Jay PA# 07-174
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/27/95

SOLID MATRIX ANALYSES

FIELD ID	Metals in soils Results per dry weight basis														CYANIDE	
	Pb	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Hg	Ni	Ag	Zn
07-174-SE-1	89 J	59.5	119	17.3 J	1520	23.2	16.0	142	21900	1180	4400	3330	0.051	18.9	44.2	3510 J
07-174-SE-2	10.9 J	120	65.1	10.1 J	2090	44.1	18.9	167	39600	970	9680	3290	0.052	23.1	8.8	1750 J
07-174-WR-1	6.0 UJ	223	33.0	2.7 J	4630	11.9	2.8	66.2	51400	8590	7030	609	0.47	7.1	12.9	644 J
BACKGROUND	4.7 UJ	9.6	87.6	1.32 JX	NR	27.2 J	9.05 J	10.8 J	21100	52.4 JX	NR	708 J	0.04	10.3	0.5 B	135
AcidBase Accounting																
FIELD ID	TOTAL SULFUR		Neutral Potent.		Tot. Sulfur		Pyritic Sulfur		Pyritic Sulfur		Lime Req. Sobeak		Lime Req. Sobeak		Lime Req. Sobeak	
	%	Acid Base	Acid Base	Acid Base	%	Acid Base	%	Acid Base	%	Acid Base	Acid Base	Acid Base	Acid Base	Acid Base	Acid Base	Acid Base
07-174-WR-1	1.63	50.9	-0.66	-51.6	1.39	0.06	0.18	1.87	-2.54	-2.54	-5.33	40.08	-50.93	-106.95		

U- Not Detected; J- Estimated Quantity; X- Outlier for Accuracy or Precision; NR- Not Requested

WATER MATRIX ANALYSES

FIELD ID	Metals in Water Results in ug/l														HARDNESS	
	Pb	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Hg	Ni	Ag	Zn
07-174-SW-1	2.7 U	1.8 U	4.8 U	0.35	7230	9.6 U	10.9 U	4.4 U	43.8	1.3 UX	1830	5.2 UJ	0.16 U	13.9 U	0.21 UJ	7.6 U
07-174-SW-2	2.7 U	1.8 U	12.8	0.23	6720	9.6 U	10.9 U	4.4 U	117	2.4 JX	2030	8.4 J	0.16 U	13.9 U	3.0 JX	32.8
Wet Chemistry Results in mg/l																
FIELD ID	Total Dissolved Solids		CHLORIDE		SULFATE		NO3/NO2-N		CYANIDE							
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l						
07-174-SW-1	<5.00	< 5	7	NR	NR	NR	NR	NR	NR	NR						
07-174-SW-2	10	< 5	14	NR	NR	NR	NR	NR	NR	NR						

U- Not Detected; J- Estimated Quantity; X- Outlier for Accuracy or Precision; NR- Not Requested

Legend

SE-1- Downstream of site, 40' below collapsed rail structure.
SE-2- Upstream from site, 50' above WR1.
WR-1- Composite WR1A, WR1B, WR1C.
BACKGROUND- From the Ripple (07-165-SS1) (1994 data).
SW-1- Same as SE-1.
SW-2- Same as SE-2.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Haystack Creek</u>	County: <u>Cascade</u>
Legal Description: T <u>14N</u> R <u>8E</u>	Section(s): <u>SW 1/4, NW 1/4, Section 16</u>
Mining District: <u>Neihart</u>	Mine Type: <u>Hardrock/Ag, Pb, Zn</u>
Latitude: <u>N 46° 58' 42"</u>	Primary Drainage: <u>Belt Creek</u>
Longitude: <u>W 110° 43' 11"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Haystack Creek/Carpenter Creek</u>
Quad: <u>Neihart</u>	Date Investigated: <u>September 23, 1995</u>
Inspectors: <u>Tuesday, Flammang, Sampson</u>	P.A. # <u>07-179</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 5,850 cubic yards. All three waste rock piles were adjacent to Haystack Creek. The following elements were elevated at least three times background:

Arsenic: 45.4J mg/kg	Cadmium: 4.7 to 4.9 mg/kg
Copper: 98.6 to 261 mg/kg	Lead: 589JX to 2,800JX mg/kg
Mercury: 0.40 to 0.73 mg/kg	Silver: 3.5 mg/kg
Zinc: 1,010 to 1,250 mg/kg	

- Two discharging adits were observed at the site. AD-2 (located at the upper portion of the site) discharged along the road. Field parameters were taken for AD-2 with a pH of 5.59. At AD-1, acute and chronic aquatic life criteria were exceeded for aluminum, cadmium, copper, and zinc. Chronic aquatic life criteria were exceeded for iron and lead, and the MCL was exceeded for cadmium. The pH for AD-1 was 3.16.

- Surface water samples taken from Haystack Creek had chronic and acute aquatic life criteria exceedences for copper and zinc. Chronic aquatic life criteria were exceeded for aluminum, cadmium, iron, and lead. No MCLs were exceeded.

- Observed releases in Haystack Creek (sediment) were documented for cadmium, lead, and zinc, and in water for cadmium, lead, zinc, and arsenic.

- Potential safety hazards observed at the site included an open adit at the upper site, two small unstable slopes associated with collapsed AD-1 and AD-2, and steep slopes on WR-2.

Haystack Creek PA# 07-179
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/23/95

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Sb (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Ca (mg/Kg)	Cr (mg/Kg)	Co (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Pb (mg/Kg)	Mg (mg/Kg)	Mn (mg/Kg)	Hg (mg/Kg)	Ni (mg/Kg)	Ag (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
07-179-SE-1	69 UJ	3.8 UJ	124	100	2590	5.4	58.6	168	25100	674 JX	5980 J	2700	0.061	16.2	1.1 U	896	NR
07-179-SE-2	59 UJ	5.0 UJ	123	0.85	1440	13.5	17.4	59.5	15900	811 JX	3560 J	940	0.042 U	13.1	1.0 U	213	NR
07-179-SE-3	57 UJ	9.4 J	142	4.4	2300	10.8	18.7	158	27900	310 JX	4180 J	859	0.050	11.1	0.75 U	970	NR
07-179-SE-4	57 UJ	9.5 J	144	2.5	1630	16.6	23.8	17.8	28300	185 JX	4150 J	153	0.073 U	19.3	0.73 U	1010	NR
07-179-WR-1	9.6 UJ	45.4 J	83.4	4.9	2260	3.7	3.3	98.6	27600	2800 JX	6420 J	148	0.40	7.0	3.5	1250	NR
07-179-WR-2	9.6 UJ	45.4 J	83.4	4.9	2260	3.7	3.3	98.6	27600	2800 JX	6420 J	148	0.40	7.0	3.5	1250	NR
07-179-WR-3	6.2 UJ	25.9 J	204	1.5	2320	11.3	8.9	261	43900	589 JX	9800 J	423	0.53	6.7	1.4	328	NR
BACKGROUND	4.7 UJ	9.6	87.6	1.32 JX	NR	27.2 J	9.05 J	10.8 J	21100	52.4 JX	NR	708 J	0.04	10.3	0.5 B	135	NR

AcidBase Accounting

FIELD ID	TOTAL SULFUR %	Total Acid Base equiv	Neutral Potent. equiv	Tot. Sulfur Acid Base Potential equiv	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	Pyritic Sulfur Acid Base equiv	Pyritic Sulfur Potential equiv	Line Req. Sulfate (lbs/ton)	Line Req. Sulfate (lbs/ton)	Potential Acidity (lbs/ton)	Line Req. Dithionite (lbs/ton)	Line Req. Dithionite (lbs/ton)
07-179-WR-1	0.12	3.75	-0.07	-3.82	0.03	0.03	0.02	-1.01	-1.01	-1.01	-2.12	3.20	-4.09	-8.59
07-179-WR-2	0.34	10.6	3.95	-6.67	0.20	0.05	0.08	1.87	2.08	2.08	4.37	9.06	-6.39	-13.42
07-179-WR-2 DUP	0.35	10.9	4.05	-6.89	0.19	0.07	0.09	2.19	1.86	1.86	3.91	9.45	-6.75	-14.18
07-179-WR-3	0.47	14.7	-0.24	-14.9	0.32	0.06	0.09	1.87	-2.12	-2.12	-4.45	12.19	-15.54	-32.62

U: Not Detected, J: Estimated Quantity, X: Outlier for Accuracy or Precision, NR: Not Requested

Metals in Water
Results in ug/l

WATER MATRIX ANALYSES

FIELD ID	Al (ug/L)	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)	HARDNESS (mg CaCO ₃ /L)
07-179-SW-1	94.4 JX	2.7 UJ	1.2 U	100	1.6	16500	9.6 U	10.9 U	6.6	313	4.2	2690	129	0.16 U	13.9 U	0.23	329	52.2
07-179-SW-2	78.4 JX	2.7 UJ	1.2 U	106	0.21	15200	9.6 U	10.9 U	7.0	319	0.61	2650	77.7	0.16 U	13.9 U	0.26	60.8	48.9
07-179-SW-3	249 JX	2.7 UJ	1.2 U	13.7	0.27	11100	9.6 U	10.9 U	14.0	1650	2.4	2380	126	0.16 U	13.9 U	0.29	77.4	37.5
07-179-SW-4	59.1 JX	2.7 UJ	1.2 U	10.7	0.20	10100	9.6 U	10.9 U	5.9	138	3.6	2210	23.6	0.16 U	13.9 U	0.21 U	49.9	34.2
07-179-AD-1	1710 JX	2.7 UJ	1.2 U	12.3	30.3	48100	9.6 U	29.5	68.9	4070	119.	4720	1110	0.16 U	28.1	0.21 U	4980	140

Wet Chemistry
Results in mg/l

FIELD ID	Total Dissolved Solids	CHLORIDE	SULFATE	NO ₃ /NO ₂ -N	CYANIDE
07-179-SW-1	124	< 5	43	NR	NR
07-179-SW-2	117	< 5	36	NR	NR
07-179-SW-3	109	< 5	39	NR	NR
07-179-SW-4	216	< 5	29	NR	NR
07-179-AD-1	338	< 5	161	NR	NR

Legend

- SE-1: 80 feet downstream of WR-1.
- SE-2: 40 feet upstream of WR-2.
- SE-3: 30' downstream of WR-3.
- SE-4: 20' upstream of open pit above WR-3.
- WR-1: Composite WR1A, WR1B.
- WR-2: Composite WR2A, WR2B.
- WR-3: Composite WR3A, WR3B.
- AD-1: Lower collapsed pit at lower site.
- BACKGROUND: From the Ripple (07-163-SS1) (1994 data).
- SW-1: Same as SE-1.
- SW-2: Same as SE-2.
- SW-3: Same as SE-3.
- SW-4: Same as SE-4.

U: Not Detected, J: Estimated Quantity, X: Outlier for Accuracy or Precision, NR: Not Requested

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Combination II</u>	County: <u>Granite</u>
Legal Description: <u>T 8N R 14W</u>	Section(s): <u>E 1/2, Section 6; E 1/2, Section 7</u>
Mining District: <u>Combination</u>	Mine Type: <u>Millsite/Au</u>
Latitude: <u>N 46° 28' 00"</u>	Primary Drainage: <u>Flint Creek</u>
Longitude: <u>W 113° 23' 30"</u>	USGS Code: <u>17010202</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>South Fork Lower Willow Creek</u>
Quad: <u>Black Pine Ridge</u>	Date Investigated: <u>October 19, 1995</u>
Inspectors: <u>Tuesday, Flammang</u>	P.A. # <u>20-009A</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- The site is the downstream extension of the Combination Millsite (P.A. # 20-009) investigated in 1993.
- The volume of tailings associated with the site was approximately 80,250 cubic yards. All of the tailings were located in the drainage of South Fork Lower Willow Creek. The following elements were elevated at least three times background:

Antimony: 229JX to 485JX mg/kg	Arsenic: 652JX to 1,490JX mg/kg
Cadmium: 15.9J to 39.5J mg/kg	Copper: 1,919JX to 5,020JX mg/kg
Lead: 3,910JX to 9,000JX mg/kg	Mercury: 70.5 to 282 mg/kg
Zinc: 220J to 353J mg/kg	
- No waste rock was observed at the site during the investigation.
- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation.
- Surface water from South Fork Lower Willow Creek flowed through the site. Acute and chronic aquatic life criteria were exceeded for copper and zinc. Chronic aquatic life criteria were exceeded for mercury and lead. Acute aquatic life criteria was exceeded for silver, and the MCL for antimony was exceeded.
- Observed releases to South Fork Lower Willow Creek (sediment) were documented for antimony, mercury, and zinc, and observed releases to water were documented for antimony and zinc.
- No potential safety hazards were observed during the investigation.

Combination II Tailings PA# 20-009
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 10/19/95

Metals in solids
Results per dry weight basis

SOLID MATRIX ANALYSES

FIELD ID	Sb	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Min	Hg	Ni	Ag	Zn	CYANIDE (mg/Kg)
20-009-SE-1	98.1 JX	266 JX	518 J	16.6 J	2220	13.8 J	19.0	1270 JX	17200 JX	1600 JX	3210	764 JX	46.7	14.5	26.3 JX	522 J	NR
20-009-SE-2	64.5 JX	259 JX	340	9.1 J	1520	7.7 J	15.1	1060 JX	13600 JX	1550 JX	1700	1070 JX	27.0	5.4	23.2 JX	286 J	NR
20-009-SE-3	79.3 JX	223 JX	460 J	12.1 J	2150	6.6 J	15.0	1220 JX	15800 JX	1450 JX	2870	707 JX	43.0	18.3	18.8 JX	310 J	NR
20-009-SE-4	26.7 JX	117 JX	351 J	5.6 J	1950	8.8 J	8.7	582 JX	11800 JX	769 JX	2190	639 JX	14.3	8.1	9.7 JX	157 J	NR
20-009-TP2	229 JX	652 JX	320 J	15.9 J	132	2.2 J	3.2	1910 JX	10700 JX	3910 JX	287	357 JX	122	2.3 U	65.0 JX	353 J	0.656
20-009-TP3	447 JX	1230 JX	400 J	36.4 J	123	2.3 U	2.6 U	4400 JX	12500 JX	7620 JX	40.5	91.5 JX	70.5	3.3 U	110 JX	220 J	1.49
20-009-TP4	485 JX	1490 JX	716 J	39.5 J	353	2.4 U	2.7 U	5020 JX	14700 JX	9000 JX	189	181 JX	282	3.5 U	108 JX	317 J	0.313
BACKGROUND	33.3	76.3	329	2	NR	6.06	6.18	116	11700	85.8	NR	1530 J	1.33 J	6.77	NR	47.4	NR

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	Neutral Percent	Acid Base Percent	Tot. Sulfur	Sulfate	Pyritic Sulfur	Organic Sulfur	Pyritic Sulfur	Acid Base Percent	Line Req. (lb/1000)	Potential Activity	Line Req. (lb/1000)	Line Req. (lb/1000)	Line Req. (lb/1000)
20-009-TP2	0.06	1.87	0.8	-1.07	0.04	0.01	0.01	0.31	0.49	1.03	1.56	-0.95	-2.00	-2.00
20-009-TP3	0.05	1.87	0.8	-1.07	0.04	0.01	0.01	0.31	0.49	1.03	1.56	-0.95	-2.00	-2.00
20-009-TP4	0.09	2.81	1.05	-1.77	0.08	-0.01	0.01	0	1.05	2.20	2.19	-1.42	-2.99	-2.99

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

Metals in Water
Results in ug/l

WATER MATRIX ANALYSES

FIELD ID	Sb	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Hg	Ni	Ag	Zn	HARDNESS (mg CaCO3/L)
20-009-SW-1	9.3	2.7	61.5	0.20	3240	8.7 U	8.3 U	23.6 J	84.0 J	2.7	1940	15.7 J	0.48 JX	16.9 U	0.52 JX	26.1	18.1
20-009-SW-2	8.8	2.5	54.4	0.16	3010	8.7 U	8.3 U	25.0 J	172 J	4.0	1820	16.8 J	0.50 JX	18.9 U	0.21 UJX	29.4	15.0
20-009-SW-3	5.8	1.8	53.5	0.16	3100	8.7 U	8.3 U	24.0 J	153 J	3.0	1810	17.9 J	0.46 JX	18.9 U	0.57 JX	22.8	15.2
20-009-SW-4	2.4	1.5 U	63.5	0.068	3370	8.7 U	8.3 U	16.5 J	160 J	1.0	1760	17.9 J	0.22 JX	16.9 U	0.48 JX	9.1 U	15.7

Wet Chemistry
Results in mg/l

FIELD ID	Total Solids	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE
20-009-SW-1	46	< 5	10	NR	NR
20-009-SW-2	38	< 5	<	NR	NR
20-009-SW-3	40	< 5	11	NR	NR
20-009-SW-4	35	< 5	5	NR	NR

Legend

SE-1- 2 miles downstream of Combination Mill in South Fork Lower Willow Creek at USFS/private boundary.
SE-2- Below Hg-amalgam mill in South Fork Lower Willow Creek, 6000 feet downstream from Combination Mill.
SE-3- Above Hg-amalgam mill in South Fork Lower Willow Creek, 5500 feet downstream from Combination Mill.
SE-4- Just below Combination Mill in South Fork Lower Willow Creek.
TP2- Composite of TP2A, 2B, 2C, 2D, 2E, 2F.
TP3- Composite of TP3A, 3B, 3C, 3D.
TP4- TP4B.
BACKGROUND- Taken from Combination Mill (20-009-SB 1) (1993 data).

SW-1- Same as SE-1.
SW-2- Same as SE-2.
SW-3- Same as SE-3.
SW-4- Same as SE-4.

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: Sunrise/Queen Millsite
Legal Description: T 8N R 14W
Mining District: Combination
Latitude: N 46° 29' 03"
Longitude: W 113° 20' 05"
Land Status: Private
Quad: Henderson Mountain
Inspectors: Tuesday, Flammang
Organization: Pioneer Technical Services, Inc.

County: Granite
Section(s): NE 1/4, NE 1/4, Section 3
Mine Type: Millsite/Au
Primary Drainage: Flint Creek
USGS Code: 17010202
Secondary Drainage: Henderson Creek
Date Investigated: October 16, 1995
P.A. # 20-036

- The volume of tailings associated with the site was approximately 1,550 cubic yards. Most of the tailings have washed out of the impoundment with approximately 95% of the remaining tailings covered with ponded water in Henderson Creek. The following elements were elevated at least three times background:
Arsenic: 866J to 1,230J mg/kg Copper: 374J to 450J mg/kg
Iron: 42,400 to 50,300 mg/kg Mercury: 4.3J to 5.9J mg/kg
- The mine site and waste rock dumps were not investigated during the investigation; the dumps were up the hillside and well away from water.
- There were no adit discharges, filled shafts, seeps, or springs investigated during the investigation.
- Surface water from Henderson Creek flowed through the tailings. Chronic aquatic life criteria was exceeded for mercury. No acute aquatic life criteria or MCLs were exceeded.
- Observed releases to Henderson Creek (sediment) was documented for arsenic, copper, and iron; arsenic and iron were observed releases to water.
- Potential safety hazards observed at the site included a collapsing bunkhouse.

Sunrise/ Queen Millsite PA# 20-036
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 10/16/95

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Sn (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
20-036-SE-1	6.8 UJX	381 J	193	1.2	3100	4.8 J	6.0 J	77.8 J	28500	9.3 UJ	3550	1710	0.19 J	3.1 UJX	1.0 U	21.7	NR
20-036-SE-2	5.5 UJX	15.2 J	91.5	0.59 U	2160	4.6 J	3.3 J	14.4 J	7280	9.1 J	1090	328	0.087 J	3.0 JX	0.78 U	23.4	NR
20-036-TP-1	10.6 JX	1230 J	40.2	2.6	480	1.3 UJ	1.5 UJ	374 J	50300	38.8 J	115	15.4	5.9 J	1.9 UJX	16.5	10.4	0.374
20-036-TP-2	6.4 UJX	866 J	69.4	2.8	1060	2.4 J	2.2 J	450 J	42400	28.1 J	777	77.7	4.3 J	3.8 JX	9.9	15.9	0.653
BACKGROUND	33.3	76.3	329	2	NR	6.06	6.18	116	11700	85.8	NR	1530 J	133 J	6.77	NR	47.4	NR

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision; NR- Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		Neutral Acid Base Potent.	Tot. Sulfur	Pyritic Sulfur	Sulfate Sulfur	Organic Sulfur	Pyritic Sulfur	Acid Base Potent.	Sulfur Potent.	Lime Req. (lb/1000)	Lime Req. Dolphop (lb/1000)	Lime Req. Dolphop (lb/1000)	
	%	tr/1000												
20-036-TP-1	0.29	9.06	-0.94	-10	0.28	-10	<0.01	0.31	-1.25	-1.25	-2.63	6.88	-9.77	-20.52
20-036-TP-2	0.33	10.3	3.04	-7.27	0.32	-7.27	0.01	0	3.04	3.04	6.38	7.81	-5.97	-12.53

WATER MATRIX ANALYSES

Metals in Water
Results in ug/l

FIELD ID	Sn (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)	HARDNESS (mg CaCO ₃ /L)
20-036-SW-1	4.6	87.9	106	0.046 U	36400	8.7 U	8.3 U	7.3 J	1540 J	0.93	7270	119 J	0.14 UJX	16.9 U	0.37 JX	9.1 U	121
20-036-SW-2	4.6	16.8	113	0.046 U	33900	8.7 U	8.3 U	3.4 J	286 J	0.95	6570	167 J	0.20 JX	16.9 U	0.46 JX	9.1 U	112

Wet Chemistry
Results in mg/l

FIELD ID	Total Dissolved Solids	CHLORIDE	SULFATE	NO ₃ NO ₂ -N	CYANIDE
20-036-SW-1	208	7	22.0	NR	NR
20-036-SW-2	174	< 5	16	NR	NR

Legend

SE-1- Downstream of site in Henderson Creek.
SE-2- Upstream of site in Henderson Creek.
TP-1- Composite of TP-1A, 1B.
TP-2- Composite of TP-2A, 2B, 3A, 3B.
BACKGROUND- Taken from the Combination Mill (20-009-SS1) (1993 data).
SW-1- Same as SE-1.
SW-2- Same as SE-2.

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision; NR- Not Requested

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: Douglas Creek Waste Rock
Legal Description: T 7N R 13W
Mining District: Philipsburg
Latitude: N 46° 18' 50"
Longitude: W 113° 16' 15"
Land Status: Private
Quad: Philipsburg
Inspectors: Tuesday, Flammang, Bisch
Organization: Pioneer Technical Services, Inc.

County: Granite
Section(s): SE 1/4, SW 1/4, Section 31
Mine Type: Hardrock/Au, Ag
Primary Drainage: Flint Creek
USGS Code: 17010202
Secondary Drainage: Douglas Creek
Date Investigated: October 19, 1995
P.A. # 20-503

- No mill tailings were observed at the site during the investigation.
- The volume of waste rock associated with the site was approximately 76,000 cubic yards. Waste rock was located adjacent to Douglas Creek and the diverted adit discharge. The following elements were elevated at least three times background:
Arsenic: 1,450JX mg/kg Lead: 116JX mg/kg
Mercury: 2.5 mg/kg
- One discharging adit was observed at the site which flowed around the waste rock. Acute and chronic aquatic life criteria were exceeded for zinc. Chronic aquatic life criteria was exceeded for iron and mercury. No MCLs were exceeded. The pH was 6.5.
- Surface water from Douglas Creek flowed near the waste rock. Acute and chronic aquatic life criteria were exceeded for zinc. Chronic aquatic life criteria was exceeded for mercury, and the MCL for antimony was exceeded.
- Potential safety hazards observed at the site included an open adit, a collapsing cabin, a loadout, and a highwall above a pit.

Douglas Creek Waste Rock PA# 20-503
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 10/19/95

SOLID MATRIX ANALYSES

FIELD ID	Metals in soils Results per dry weight basis														CYANIDE (mg/kg)		
	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)	
20-503-SE-1	45.3 JX	1770 JX	169 J	3.5 J	1130	2.1 UJ	4.0	62.8 JX	13300 JX	331 JX	1140	5610 JX	2.3	3.1 U	48.1 JX	661 J	NR
20-503-SE-2	28.1 JX	1910 JX	160 J	3.3 J	1260	2.1 J	4.9	65.4 JX	11200 JX	313 JX	1690	5900 JX	4.1	2.9 U	71.5 JX	672 J	NR
20-503-WR-1	5.9 JX	1450 JX	152 J	1.2 J	1700	1.9 UJ	2.9	16.4 JX	16900 JX	116 JX	1150	258 JX	2.5	2.7 U	27.2 JX	57.8 J	NR
BACKGROUND	4 UJ	25 J	286	0.5 U	NR	4.6	9.8	9	13900	9	NR	1230	0.161 JX	11	NR	41	NR

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

Acid/Base Accounting

FIELD ID	Total Sulfur				Total Sulfur				Pyritic Sulfur				Pyritic Sulfur				Lime Req.			
	TOTAL SULFUR %	%	Acid Base equiv	Potential equiv	Tot. Sulfur Acid Base equiv	%	Sulfate Sulfur equiv	%	Pyritic Sulfur Acid Base equiv	%	Potential equiv	Acid Base equiv	Pyritic Sulfur Acid Base equiv	%	Potential equiv	Acid Base equiv	Lime Req. Dol/hop/ equiv	Dol/hop/ equiv	Lime Req. Dol/hop/ equiv	res. ltr.
20-503-WR-1	0.37	11.6	9.4	0.3	9.4	0.3	0.29	0.02	<0.01	0.07	0.06	0.62	1.34	2.16	2.16	4.54	-8.82	-8.82	-18.53	
20-503-WR-1 (dup)	0.37	11.6	9.6	0.29	9.6	0.29			0.02	0.06	0.62	1.34	2.81	1.34	2.81	2.81	-9.17	-19.26		

WATER MATRIX ANALYSES

FIELD ID	Metals in Water Results in ug/l														HARDNESS (mg CaCO ₃ /l)		
	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)	
20-503-SW-1	6.9	101	18.0	1.6	61000	8.7 U	8.3 U	5.8 J	886 J	1.5	11700	9180 J	0.14 UJX	169 U	1.9 JX	1550	200
20-503-SW-2	8.1	128	22.7	0.25	15500	8.7 U	8.3 U	4.7 J	294 J	1.4	3320	1700 J	0.17 JX	169 U	0.21 UJX	417	52.3
20-503-AD-1	4.6	188	12.4	3.5	131000	8.7 U	9.1	12.1 J	3830 J	1.5	24200	21700 J	0.22 JX	169 U	4.2 JX	3330	428

Wt Chemistry Results in mg/l

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

Legend

SE-1: Downstream of site in Douglas Creek.
 SE-2: Upstream of site in Douglas Creek.
 WR-1: Composite of waste rock from the Douglas Creek Waste Rock PA# 20-503.
 AD-1: Composite of waste rock from the Douglas Creek Waste Rock PA# 20-503.
 AD-2: Adl discharge above WRT-1.
 SW-1: Same as SE-1.
 SW-2: Same as SE-2.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Port Royal Mill Tailings</u> Legal Description: T <u>8N</u> R <u>12W</u> Mining District: <u>Princeton</u> Latitude: <u>N 46° 22' 00"</u> Longitude: <u>W 113° 07' 00"</u> Land Status: <u>Public</u> Quad: <u>Maxville/Pikes Peak</u> Inspectors: <u>Tuesday, Flammang, Bisch</u> Organization: <u>Pioneer Technical Services, Inc.</u>	County: <u>Granite</u> Section(s): <u>NE 1/4, Section 32; NW 1/4, NW 1/4, Section 33</u> Mine Type: <u>Tailings/Au</u> Primary Drainage: <u>Flint Creek</u> USGS Code: <u>17010202</u> Secondary Drainage: <u>Royal Gold Creek/Boulder Creek</u> Date Investigated: <u>October 17, 1995</u> P.A. # <u>20-016</u>
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- The volume of mill tailings observed at the site was approximately 3,875 cubic yards. The tailings were mostly revegetated. The following elements were elevated at least three times background:

Antimony: 16.8JX mg/kg	Arsenic: 54J to 63.6J mg/kg
Cadmium: 3.8 mg/kg	Copper: 429J to 924J
Lead: 1,290J to 2,050J	Mercury: 1.3J to 11.6J mg/kg
Zinc: 786 to 1,480 mg/kg	
- No waste rock dumps were observed at the site during the investigation.
- No discharging adits, filled shafts, seeps, or springs were observed at the site during the investigation.
- Royal Gold Creek flowed through the tailings. The acute and chronic aquatic life criteria were exceeded for copper. The chronic aquatic life criteria was exceeded for mercury and lead, while the acute aquatic life criteria was exceeded for silver. No MCLs were exceeded.
- An observed release in Royal Gold Creek (sediment) of arsenic, cadmium, copper, mercury, and zinc was attributable to the site.
- No potential safety hazards were observed at the site during the investigation.

Port Royal Mill Tailings PA# 20-016
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 10/17/95

SOLID MATRIX ANALYSES

FIELD ID	Metals in soils Results per dry weight basis														CYANIDE (mg/kg)			
	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Cs (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)			
20-016-SE-1	8.8 JX	6.9 UJ	49.3	1.9	1100	2.5 UJ	2.9 UJ	51.2 J	8400	389 J	1530	0.17 J	3.7 UJX	1.2 U	275	NR		
20-016-SE-2	7.9 JX	8.8 JX	45.5 J	2.0 J	938	2.2 UJ	2.5 U	32.8 JX	143 JX	817 JX	812	0.084	3.1 U	19 JX	652 J	NR		
20-016-SE-3	15.2 UJX	31.8 JX	84.5 J	5.8 J	5330	4.7 UJ	6.9	206 JX	13400 JX	2050 J	2170	11.6 J	6.8 U	7.5 JX	1000 J	NR		
20-016-TP1	18.6 JX	83.6 J	78.2	3.8	905	2.6 UJ	3.0 UJ	924 J	11800	1290 J	580	255	3.8 UJX	17.8	1480	1.08		
20-016-TP2	12.7 JX	54.0 J	80.4	2.4	701	1.8 UJ	2.0 UJ	429 J	9510	1290 J	644	1.3 J	2.6 UJX	4.1	786	<0.282		
BACKGROUND	5 U	17 JX	122	0.8 J	NR	34.2 J	10.4 J	34.6	23500 J	38 J	NR	1040 J	0.06 J	36 J	106 J	NR		

Acid/Base Accounting

FIELD ID	TOTAL SULFUR		Neutral Potent.		Tot. Sulfur Acid Base Potential		Pyritic Sulfur		Pyritic Sulfur		Lime Req. Acid Base Potential		Lime Req. Acid Base Potential		Lime Req. Acid Base Potential		Lime Req. Acid Base Potential		Lime Req. Acid Base Potential	
	%	g/g	g/g	g/g	g/g	g/g	%	g/g	%	g/g	g/g	g/g	g/g	g/g	g/g	g/g	g/g	g/g	g/g	g/g
20-016-TP1	0.02	0.62	2.63	2.01	0.02	0.01	<0.01	<0.01	0	2.63	2.63	3.14	5.52	0.47	2.70	5.67	7.63	7.63	7.63	7.63
20-016-TP2	0.01	0.31	3.14	2.82	0.01	0.01	<0.01	<0.01	0	3.14	3.14	6.59	6.59	0.23	3.63	7.63	7.63	7.63	7.63	7.63

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

WATER MATRIX ANALYSES

WATER MONITORING ANALYSIS																	
Metals in Water Results in µg/l																	
FIELD ID	Sb (µg/L)	As (µg/L)	Ba (µg/L)	Cd (µg/L)	Ca (µg/L)	Cr (µg/L)	Co (µg/L)	Cu (µg/L)	Fe (µg/L)	Pb (µg/L)	Mg (µg/L)	Mn (µg/L)	Hg (µg/L)	Ni (µg/L)	Ag (µg/L)	Zn (µg/L)	HARDNESS (mg CaCO ₃ /L)
20-016-SW-1	1.9	1.5 U	3.2	0.046 U	7250	8.7 U	8.3 U	5.0 J	34.4 J	1.4	585	4.5 J	0.17 JX	16.9 U	0.34 JX	16.0	20.5
20-016-SW-2	1.9 U	1.5 U	4.5	0.046 U	7270	8.7 U	8.3 U	6.5 J	176 J	2.9	584	32.5 J	0.22 JX	16.9 U	0.25 JX	12.6	20.6
20-016-SW-3	1.9 U	1.5 U	4.2	0.046 U	7860	8.7 U	8.3 U	5.9 J	130 J	2.3	638	7.9 J	0.20 JX	16.9 U	0.53 JX	15.9	22.3

U = Not Reported J = Estimated JX = Off-line Accuracy or Precision, NR = Not Requested

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

Wet Chemistry
Results in µg/l

FIELD ID	CHLORIDE		SULFATE		NINOX-2-N		CYANIDE	
	g/g	g/g	g/g	g/g	g/g	g/g	g/g	g/g
20-016-SW-1	28	< 5	5	NR	NR	NR	NR	NR
20-016-SW-2	32	< 5	6	NR	NR	NR	NR	NR
20-016-SW-3	41	< 5	6	NR	NR	NR	NR	NR

Legend

SE-1- Upstream of Tailings in Royal Gold Creek
SE-2- Just below tailings disposal deposit in Royal Gold Creek
SE-3- Above Norparallel in Royal Gold Creek
TP-1- Composite TPA, TPA, TPA (floodplain)
TP-2- Composite TPA, TPA, TPA (floodplain)
TP-3- Composite TPA, TPA, TPA (floodplain)
BACKGROUND- Taken from Jackson Park Mine (20-027-S51) (1993 data).
SW-1- Same as SE-1.
SW-2- Same as SE-2.
SW-3- Same as SE-3.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

5-12

Bullion Smelter PA# 22-505
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/4/95

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Sb (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Ca (mg/Kg)	Cr (mg/Kg)	Co (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Pb (mg/Kg)	Mg (mg/Kg)	Mn (mg/Kg)	Hg (mg/Kg)	Ni (mg/Kg)	Ag (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
22-505-SE-1	5.6 UJ	5.4	75.4	0.59 U	1690	5.8	6.5	19.4 J	11900	20.8 J	1880	383	0.054	3.3	1.33	95.7 J	NR
22-505-SE-2	5.8 UJ	6.1	106	0.96	1480	7.1	16.0	15.8 J	15000	14.9 J	3090	735	0.048 U	6.3	0.96 U	44.2 J	NR
22-505-SL-1	17.4 J	45.9	299	6.6	97500	14.6	63.6	1940 J	199000	767 J	5390	6380	0.065	23.3	30.4	9510 J	NR
22-505-WR-1	7.5 J	371	184	0.58 U	611	16.3	9.9	77.7 J	26000	286 J	5060	348	0.040	10.2	2.4	72.0 J	NR
BACKGROUND	5 U	68 J	344	0.6 U	NR	20.3	22.1	35	35000	39 J	NR	6830	0.08 J	21	NR	188	NR

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision; NR- Not Requested

Acid/Base Accounting

FIELD ID	TOTAL SULFUR %	Sulfur Acid Base unreact	Neutral Potentl unreact	Tot Sulfur Acid Base unreact	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	Pyritic Sulfur Acid Base unreact	Pyritic Sulfur Acid Base Potential unreact	Potential Acidity	Lime Req. Sobek (lbs./T)	Lime Req. Dolthoff (grains)	Lime Req. Dolthoff (lbs./T)
22-505-SL1	0.82	25.6	38.5	12.9	0.38	0.02	0.42	0.62	37.90	22.66	79.59	19.80	41.59
22-505-WR-1	0.03	0.94	1.29	0.35	0.02	<0.01	0.01	0.00	1.29	0.78	2.71	0.64	1.34

Metals in Water
Results in ug/l

FIELD ID	Al (ug/L)	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)	HARDNESS (mg CaCO ₃ /L)
22-505-SW-1	50.3 JX	2.7 UJ	1.2 U	35.4	0.064 U	6710	9.6 U	10.9 U	4.4 U	90.7	0.58 U	1430	5.2 U	0.16 U	13.9 U	0.56	7.6 U	22.6
22-505-SW-2	54.7 JX	2.7 UJ	1.2 U	35.9	0.064 U	6530	9.6 U	10.9 U	4.4 U	77.3	0.58 U	1430	5.2 U	0.16 U	13.9 U	0.21 U	7.6 U	22.2

Wet Chemistry
Results in mg/l

FIELD ID	Total Dissolved Solids	CHLORIDE	SULFATE	NO ₃ /NO ₂ -N	CYANIDE
22-505-SW-1	194	< 5	< 5	NR	NR
22-505-SW-2	50	< 5	6	NR	NR

Legend

SE-1- Downstream of site in tributary.
SE-2- Upstream of site in tributary.
SL-1- Slag pile in west-center of site.
WR-1- Subsample of WR1B.
BACKGROUND- From the Bullion Mine (22-008-S51) (1993 data).
SW-1- Same as SE-1.
SW-2- Same as SE-2.

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision; NR- Not Requested

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Frohner</u> Legal Description: <u>T 8N R 5W</u> Mining District: <u>Clancy</u> Latitude: <u>N 46° 26' 28"</u> Longitude: <u>W 112° 12' 48"</u> Land Status: <u>Private</u> Quad: <u>Chessman Reservoir</u> Inspectors: <u>Tuesday, Flammang, Clark, Liebelt</u> Organization: <u>Pioneer Technical Services, Inc.</u>	County: <u>Jefferson</u> Section(s): <u>NW 1/4, SE 1/4, Section 15</u> Mine Type: <u>Hardrock/Au, Ag, Cu, Pb, Zn</u> Primary Drainage: <u>Lump Gulch</u> USGS Code: <u>10030101</u> Secondary Drainage: <u>Lump Gulch</u> Date Investigated: <u>September 15, 1995</u> P.A. # <u>22-243</u>
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- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 11,730 cubic yards. Adit discharges flowed over and through WR-6 and WR-7. The following elements were elevated at least three times background:
Antimony: 16.3J mg/kg Arsenic: 372J to 6,050 mg/kg
Copper: 48.2J mg/kg Lead: 261J to 4,250J mg/kg
Mercury: 0.62 to 0.97 mg/kg

- Two discharging adits were observed at the site which flowed over and through the waste rock. At AD-1, the acute and chronic aquatic life criteria were exceeded for cadmium, copper, lead, and zinc; pH was 7.49. Chronic aquatic life criteria was exceeded for aluminum and iron. The MCL was exceeded for cadmium. At AD-2, the acute and chronic aquatic life criteria were exceeded for aluminum, arsenic, copper, lead, and zinc; pH was 3.90. The chronic aquatic life criteria was exceeded for iron, and the MCL was exceeded for cadmium.

- Surface water flowed from an unnamed tributary of Lump Gulch along the base of WR-7. Acute and chronic aquatic life criteria were exceeded for aluminum, cadmium, copper, and zinc. Chronic aquatic life criteria was exceeded for iron and lead, and the MCL was exceeded for cadmium.

- An observed release to the unnamed tributary of Lump Gulch was documented for arsenic and lead in water and sediments, and copper in water.

- Potential safety hazards observed at the site included a cabin and a fenced open stope; two open shafts exist, but have been grated.

Frohner Mine PA# 22-243
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/15/95

Metals in soils Results per dry weight basis		SOLID MATRIX ANALYSES															
FIELD ID	Sr (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Cs (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
22-243-SE-1	5.9 UJ	375 J	62.3	1.8	789	3.0	5.6	16.5	10400	298 J	1160 J	1200	0.065	5.8	1.0 U	192	NR
22-243-SE-2	7.0 UJ	8.0 J	312	0.88	1030	4.2	6.4	7500	16.6 J	1010 J	3120	0.048	0.048	3.2 U	0.71 U	28.3	NR
22-243-SE-2	18.3 J	6050	52.4	0.56 U	17.6	1.6 U	1.9 U	48.2 J	10700	4250 J	19.1	3.3	0.97	2.4 U	26.6	50.3 J	NR
22-243-WR-1	5.5 UJ	372 J	26.9	0.59 U	36.9	1.7 U	1.9 U	9.8 J	3660	1410 J	31.7 J	6.8	0.62	3.2	2.8	88.8	NR
22-243-WR-2	5.4 UJ	802	76.4	0.57 U	66.9	1.7 U	1.9 U	9.8 J	8020	261 J	19.7	16.9	0.62	2.4 U	1.1	59.0 J	NR
22-243-WR-3																	
BACKGROUND	3.4 UJ	10	52.7	1.3	NR	2.23 J	3.15	6.12	6390	21.9	NR	284	0.035 J	2.6	NR	43.6	NR
U: Not Detected, J: Estimated Quantity, X: Outlier for Accuracy or Precision; NR: Not Requested																	
AcidBase Accounting																	
FIELD ID	TOTAL SULFUR %	Total Sulfur mg/kg	Neutral Percent	Total Sulfur Potential	Sulfate %	Sulfate mg/kg	Pyritic Sulfur %	Pyritic Sulfur mg/kg	Organic Sulfur %	Pyritic Sulfur mg/kg	Acid Base Potential	Lime Req. Sobek (mg/kg)	Potential Acidity (mg/kg)	Lime Req. Dallhoff (mg/kg)	Lime Req. Dallhoff (mg/kg)	Lime Req. Dallhoff (mg/kg)	Lime Req. Dallhoff (mg/kg)
22-243-WR-1	0.26	8.12	-1.71	-9.38	0.23		0.01	0.01	0.02	0.31	-2.02	-4.24	6.33	-10.05	-21.10		
22-243-WR-2	0.08	2.50	-0.86	-3.36	0.07	0.01	<0.01	0.31	<0.01	0.31	-1.17	-2.46	1.95	-3.52	-7.38		
22-243-WR-3	0.12	3.75	-3.90	-7.65	0.11		0.01		<0.01	0.31	-4.21	-8.84	2.89	-8.49	-17.83		

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

WATER MATRIX ANALYSES																			
Metals in Water Results in µg/l		Al	Sn	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Hg	Mn	Hg	Ni	Ag	Zn	HARDNESS (mg CaCO ₃ /L)
FIELD ID		(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)
22-243-SW-1	853 J	2.7 UJ	35.6	19.4	7.3	12700	9.6 U	10.9 U	13.5	1730	15.4	2020	2460	0.16 U	13.9 U	0.80	40.1	1420	
22-243-SW-2	37.1 UJ	2.7 UJ	1.2 U	16.6	0.064 U	8780	9.6 U	10.9 U	4.4 U	40.4	0.58 U	1180	5.2 U	0.16 U	13.9 U	0.23	26.8	7.6 U	
22-243-AD-1	199 J	2.7 UJ	120	55.5	6.9	12800	9.6 U	10.9 U	22.1	1920	112	1240	610	0.18 U	13.9 U	0.31	37.0	1060	
22-243-AD-2	1350 J	2.7 UJ	1440	17.0	36.1	24800	9.6 U	33.0	20.8	33200	459	4550	10000	0.16 U	25.1	1.8	80.9	5590	
U - Not Detected, J - Estimated Quantity, X - Outlier for Accuracy or Precision, NR - Not Requested																			
Wet Chemistry Results in mg/l																			
Total Dissolved Solids		CHLORIDE		SULFATE		NO ₃ NO ₂ -N		CYANIDE											
FIELD ID																			
22-243-SW-1	119	< 5	60	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
22-243-SW-2	51	< 5	7	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
22-243-AD-1	106	< 5	41	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
22-243-AD-2	297	< 5	178	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Legend

SE-1 - 40 feet downstream of WR7 in Lump Gulch.
SE-2 - Spectrum of WR7 in Lump Gulch.
AD-1 - Composite WR7 and WR8.
AD-2 - Discharging area associated with WR7.
SW-1 - Same as SE-1.
SW-2 - Same as SE-2.
WR-1 - Composite WR1, WR2, WR3, and WR4.
WR-2 - Composite WR5 and WR8.
WR-3 - Composite WR7A and WR7B.

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

Legend

SE-1, AD test downstream of WR7 in Lump Gulch.
 SE-2, UJ- Underflow of WR7 in Lump Gulch.
 AD-1, Discharging effluent associated with WR6.
 AD-2, Discharging effluent associated with WR7.
 SW-1, Same as SE-1.
 SW-2, Same as SE-2.
 WR-1, Composite WR1, WR2, WR3, and WR4.
 WR-2, Composite WR5 and WR6.
 WR-3, Composite WR7A and WR7B.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Carter</u>	County: <u>Judith Basin</u>
Legal Description: <u>T 15N R 9E</u>	Section(s): <u>SW 1/4, NW 1/4, Section 6</u>
Mining District: <u>Hughesville</u>	Mine Type: <u>Hardrock/Ag, Pb</u>
Latitude: <u>N 47° 05' 25"</u>	Primary Drainage: <u>Dry Fork Belt Creek</u>
Longitude: <u>W 110° 38' 36"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Green Creek/Galena Creek</u>
Quad: <u>Barker</u>	Date Investigated: <u>September 26, 1995</u>
Inspectors: <u>Tuesday, Flammang, Liebelt</u>	P.A. # <u>23-019</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 3,500 cubic yards. Water from the adit discharge flowed over and on the east side of the lower waste rock dump. The following elements were elevated at least three times background:

Arsenic: 205 to 214 mg/kg	Cadmium: 6.7J mg/kg
Copper: 135JX to 564JX mg/kg	Iron: 121,000 mg/kg
Lead: 1,840 to 2,050 mg/kg	Manganese: 2,270 mg/kg
Mercury: 0.15 to 0.32 mg/kg	

- One discharging adit was observed at the site which flowed over and along the waste rock. The chronic aquatic life criteria was exceeded for iron. No acute aquatic life criteria or MCLs were exceeded. The pH was 7.3.

- Green Creek flowed 75 to 100 feet from the waste rock dump. The chronic aquatic life criteria was exceeded for lead. No acute aquatic life criteria or MCLs were exceeded.

- An observed release to Green Creek was documented for copper (sediment) and iron (water).

- Potential safety hazards associated with the site included an adit opening, a highwall associated with the adit, and unstable waste rock piles.

Carter Mine PA# 23-019
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE:

SOLID MATRIX ANALYSES

FIELD ID	Metals in soils Results per dry weight basis														CYANIDE (mg/kg)	
	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Cs (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fs (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)
23-019-SE-1	6.0 UJ	38.7	67.7 J	2.9 J	6890	1.9 U	3.9	163 JX	22700	70.1	3690	638	0.049 U	4.0	0.9 U	442
23-019-SE-2	10.2 UJ	34.7	102 J	3.0 J	32400	4.9	7.3	48.8 JX	20400	67.2	15900	513	0.069 U	11.3	1.5 U	696
23-019-WR-1	5.4 UJ	214	97.4 J	1.5 J	51900	1.7 U	5.7	135 JX	30000	1840	31100	2270	0.32	9.7	22.9	287
23-019-WR-2	6.8 UJ	205	46.6 J	6.7 J	23800	2.1 U	2.4 U	564 JX	121000	2050	6180	180	0.15	3.1 U	12.0	228
BACKGROUND	3.98 UJ	5.1 J	159 J	1 U	NR	8.09 J	3.83	9.81 J	13300	61.4	NR	548	0.02772	7.93	NR	130
Acid/Base Accounting																
FIELD ID	TOTAL SULFUR		Total Sulfur		Sulfate Sulfur		Pyritic Sulfur		Pyritic Sulfur		Lime Req. Solub. Pres. 1 tc.		Lime Req. Solub. Pres. 1 tc.		Lime Req. Solub. Pres. 1 tc.	
	%	g/g	%	g/g	%	g/g	%	g/g	%	g/g	%	g/g	%	g/g	%	g/g
23-019-WR-1	0.72	22.5	184	162	0.15	0.24	0.33	7.50	177.00	177.00	-9.38	21.33	203.34	427.01		
23-019-WR-2	3.21	100	20.9	-79.3	1.07	0.37	1.77	11.6	-9.38	-9.38	-19.70	91.96	-88.82	-186.52		

U-Not Detected, J-Estimated Quantity, X-Officer for Accuracy or Precision, NR-Not Requested

WATER MATRIX ANALYSES

FIELD ID	Metals in Water Results in ug/l														HARDNESS (mg CaCO ₃ /l)	
	Sb (ug/l)	As (ug/l)	Ba (ug/l)	Cd (ug/l)	Ca (ug/l)	Cr (ug/l)	Co (ug/l)	Cu (ug/l)	Fs (ug/l)	Pb (ug/l)	Mg (ug/l)	Mn (ug/l)	Hg (ug/l)	Ni (ug/l)	Ag (ug/l)	Zn (ug/l)
23-019-SW-1	2.7 U	6.9	27.8	0.16	45600	9.6 U	10.9 U	4.4 U	518	2.9 JX	18200	113 J	0.16 U	13.9 U	0.21 UJX	93.8
23-019-SW-2	2.7 U	2.5	38.6	0.064 UJ	53900	9.6 U	10.9 U	4.4 UJ	136	1.4 J	14800	40.5	0.16 U	13.9 U	0.21 U	11.0 J
23-019-AD-1	2.7 U	14.9	8.5	0.064 UJ	39700	9.6 U	10.9 U	8.3 J	1410	1.2 J	20800	205	0.16 U	13.9 U	1.1	86.8 J

U-Not Detected, J-Estimated Quantity, X-Officer for Accuracy or Precision, NR-Not Requested

Wet Chemistry
Results in mg/l

FIELD ID	Total Dissolved Solids	CHLORIDE	SULFATE	NO ₃ /NO ₂ -N	CYANIDE
23-019-SW-1	198	< 5	46	NR	NR
23-019-SW-2	184.0	< 5	27.0	NR	NR
23-019-AD-1	168.0	< 5	42	NR	NR

Legend

SE-1-8' downstream of tail discharge confluence with Green Creek.
 SE-2- 250' upstream of WR1 north side
 WR-1- Composite of WR1A, WR1B, WR1C.
 WR-2- Composite of WR2A, WR2B, WR2C.
 AD-1- Taken at adit portal.
 AD-2- Taken at adit portal.
 SW-1- Same as SE-1.
 SW-2- Same as SE-2.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>M.T.A.</u> Legal Description: <u>T 15N R 9E</u> Mining District: <u>Hughesville</u> Latitude: <u>N 47° 04' 55"</u> Longitude: <u>W 110° 37' 47"</u> Land Status: <u>Private</u> Quad: <u>Barker</u> Inspectors: <u>Tuesday, Flammang, Liebelt</u> Organization: <u>Pioneer Technical Services, Inc.</u>	County: <u>Judith Basin</u> Section(s): <u>NW 1/4, NE 1/4, Section 7</u> Mine Type: <u>Hardrock/Ag-Pb</u> Primary Drainage: <u>Dry Fork Belt Creek</u> USGS Code: <u>10030105</u> Secondary Drainage: <u>Galena Creek</u> Date Investigated: <u>September 26, 1995</u> P.A. # <u>23-040</u>
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- No mill tailings were observed at the site during the investigation.
- The volume of waste rock associated with the site was approximately 5,260 cubic yards. Waste rock was situated in a steep, dry drainage that discharges to Galena Creek. The following elements were elevated at least three times background:

Antimony: 14.8J mg/kg	Arsenic: 744 mg/kg
Barium: 159J mg/kg	Cadmium: 9.5J mg/kg
Copper: 66.7JX mg/kg	Lead: 11,900 mg/kg
Mercury: 3 mg/kg	Zinc: 1,640 mg/kg
- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation, though one adit probably discharges at wetter times of the year.
- No surface water flowed on or near the site during the investigation. The nearest surface water was over 1,000 feet away; no surface water samples were collected.
- Potential safety hazards observed at the site included two open adits and a loadout.

M.T.A. PA# 23-040
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/26/95

SOLID MATRIX ANALYSES

SOLID MATRIX ANALYSES																		
FIELD ID	Metals in soils Results per dry weight basis																	
	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Cs (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)		
23-040-WR-1	14.8 J	744	641 J	9.5 J	299	1.7 U	2.0 U	66.7 JX	32100	11900	441	79.0	3.0	2.5 U	40.6	1640	NR	
BACKGROUND	3.98 UJ	5.1 J	159 J	1 U	NR	8.09 J	3.83	9.81 J	13300	61.4	NR	548	0.02772	7.93	NR	130	NR	
Acid/Base Accounting																		
FIELD ID	Total Sulfur			Neutral Potent 1/10000			Acid Base 1/10000			Pyritic Sulfur			Pyritic Sulfur			Pyritic Sulfur		
	TOTAL SULFUR %																	
23-040-WR-1	1.22	38.1	-4.70	-42.8	1.04	0.06	0.12	1.87	-6.58	-6.58	-6.58	-13.82	30.00	-43.38	-91.09			

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

Legend

WR-1, WR1A, 2A, 2B, 3A, 3B
BACKGROUND- From the Tiger Mine (23-059-SS) (1993 data).

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: Belfont
Legal Description: T 15N R 9E
Mining District: Hughesville
Latitude: N 47° 05' 18"
Longitude: W 110° 37' 32"
Land Status: Private
Quad: Barker
Inspectors: Tuesday, Flammang, Liebelt
Organization: Pioneer Technical Services, Inc.

County: Judith Basin
Section(s): NE 1/4, SE 1/4, Section 6
Mine Type: Hardrock/Ag, Pb
Primary Drainage: Dry Fork Belt Creek
USGS Code: 10030105
Secondary Drainage: Daisy Creek/Galena Creek
Date Investigated: September 26, 1995
P.A. # 23-060

- No mill tailings were observed at the site during the investigation.
- The volume of waste rock associated with the site was approximately 2,325 cubic yards. The following elements were elevated at least three times background:

Arsenic: 1,030 mg/kg	Barium: 529 mg/kg
Cadmium: 5.7J mg/kg	Copper: 45.4 mg/kg
Iron: 44,600 mg/kg	Lead: 2,850 mg/kg
Mercury: 1.2 mg/kg	Zinc: 872J mg/kg
- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation, though at wetter times of the year, the adit shows evidence of discharging.
- Surface water flow from Daisy Creek was adjacent to the waste rock. Chronic and acute aquatic life criteria were exceeded for copper and zinc. Chronic aquatic life criteria were exceeded for cadmium and lead. No MCLs were exceeded.
- Potential safety hazards observed at the site included an open adit, two cabins, and a highwall.

BELFONT MINE PAR 23-060
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/26/95

SOLID MATRIX ANALYSES

SOLID MATRIX ANALYSES																	
FIELD ID	Metals in soils Results per dry weight basis														CYANIDE (mg/kg)		
	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)	
23-060-SE-1	7.1 UJ	39.9	265	10.0 J	2130	5.9	5.3	482	47200	1410	1090	5630	0.15	5.0	4.9	1540 J	NR
23-060-SE-2	7.2 UJ	152	818	25.1 J	16100	5.6	2.5 U	1820	98000	9120	5940	17300	0.28	3.2 U	38.4	4960 J	NR
23-060-WR-1	7.8 J	1030	529	5.7 J	37.0	6.0	2.0 U	45.4	44600	2850	483	151	1.2	2.6 U	49.7	872 J	NR
BACKGROUND	3.98 UJ	5.1 J	159 J	1 U	NR	8.09 J	3.83	9.81 J	13300	61.4	NR	548	0.02772	7.93	NR	130	NR
U = Not Detected; J = Estimated Quantity; X = Outlier for Accuracy or Precision; NR = Not Requested																	
AcidBase Accounting																	
FIELD ID	TOTAL SULFUR %		Neutral Potent. (meq/100g)	Tot. Sulfur AcidBase Potential (meq/100g)	Sulfate %	Pyritic Sulfur %	Organic Sulfur %	Pyritic Sulfur AcidBase Potential (meq/100g)	Sulfur AcidBase Potential (meq/100g)	Line Req. Sobeik (meq/100g)	Line Req. Sobeik (meq/100g)	Potential Acidity (meq/100g)	Line Req. Dolphoff (meq/100g)	Line Req. Dolphoff (meq/100g)			
	%	meq/100g	meq/100g	meq/100g	%	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g			
23-060-WR-1	1.44	45.0	-9.78	-54.8	0.77	0.14	0.53	4.37	-14.20	-14.20	-29.82	38.99	-60.96	-128.01			

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

WATER MATRIX ANALYSES

FIELD ID	Metals in Water Results in ug/l														HARDNESS (mg CaCO ₃ /L)		
	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)	
23-060-SW-1	2.7 U	1.9	27.0	3.3	55900	9.6 U	10.9 U	142	357	32.3 JX	18100	844 J	0.18 U	13.9 U	0.66 JX	918	214
23-060-SW-2	2.7 U	1.8 U	24.8	4.3	60800	9.6 U	10.9 U	197	481	41.2 JX	19700	1060 J	0.16 U	13.9 U	2.7 JX	1020	233
Wet Chemistry Results in mg/l																	
FIELD ID	Total Dissolved Solids		CHLORIDE		SULFATE		NO ₃ /NO ₂ -N		CYANIDE								
23-060-SW-1	306	<	5		170												
23-060-SW-2	305	<	5		188												

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

Legend

SE-1: Downstream of site in Dirty Creek.
 SE-2: Downstream of site in Dirty Creek.
 WR-1: Downstream of site in Dirty Creek.
 WR-2: Downstream of site in Dirty Creek.
 BACKGROUND: From the Tiger Mine (23-069-SS1) (1993 data).
 SW-1: Same as SE1.
 SW-2: Same as SE2.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Sinclair</u>	County: <u>Judith Basin</u>
Legal Description: <u>T 15N R 9E</u>	Section(s): <u>NE 1/4, NW 1/4, Section 7</u>
Mining District: <u>Hughesville</u>	Mine Type: <u>Hardrock/Ag, Pb</u>
Latitude: <u>N 47° 04' 55"</u>	Primary Drainage: <u>Dry Fork Belt Creek</u>
Longitude: <u>W 110° 38' 07"</u>	USGS Code: <u>10030105</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Galena Creek</u>
Quad: <u>Barker</u>	Date Investigated: <u>September 27, 1995</u>
Inspectors: <u>Tuesday, Flammang, Liebelt</u>	P.A. # <u>23-501</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 1,679 cubic yards. The waste rock was adjacent to an unnamed tributary of Galena Creek. The following elements were elevated at least three times background:

Arsenic: 203 mg/kg	Copper: 33 mg/kg
Lead: 5,000 mg/kg	Mercury: 1.1 mg/kg

- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation.

- Surface water flowed from an unnamed tributary of Galena Creek along the base of the waste rock. Acute and chronic aquatic life criteria were exceeded for cadmium, copper, lead, and zinc. Chronic aquatic life criteria was exceeded for iron, and the MCL was exceeded for cadmium.

- An observed release to the unnamed tributary of Galena Creek (sediment) was documented for arsenic, copper, mercury, and (water) lead.

- Potential safety hazards observed at the site included a gated adit and a cabin.

Sinclair Mine PA# 23-501
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/27/95

SOLID MATRIX ANALYSES

SOLID MATRIX ANALYSES																	
FIELD ID	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
23-501-SE-1	15.4 J	664	313	6.5 J	1610	5.7	3.1 U	236	40700	9960	810	289	1.7	3.9 U	115	1100 J	NR
23-501-SE-2	10.3 J	157	77.0	1.2 J	695	2.6	2.3 U	53.4	9910	6380	386	96.3	0.18	2.8 U	28.3	204 J	NR
23-501-WR-1	7.2 J	203	191	1.3 J	69.8	1.5 U	1.7 U	33.0	16000	5000	78.7	35.7	1.1	2.2 U	28.8	200 J	NR
BACKGROUND	3.98 UJ	5.1 J	159 J	1 U	NR	8.09 J	3.83	9.81 J	13300	61.4	NR	548	0.02772	7.93	NR	130	NR
U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested																	
Acid/Base Accounting																	
FIELD ID	TOTAL SULFUR %		Neutral Potent. (meq/lb)	Tot. Sulfur Acid Base equiv. (meq/lb)		Pyritic Sulfur Acid Base equiv. (meq/lb)		Pyritic Sulfur Acid Base equiv. (meq/lb)		Lime Req. Sobeik (meq/lb)		Potential Acidity (meq/lb)		Lime Req. Dolphopf (meq/lb)		Lime Req. (meq/lb)	
23-501-WR1	0.57	17.8	-3.14	-20.9	0.51	0.03	0.03	0.94	-4.08	-4.08	-4.08	-8.57	13.83	-21.21	-44.54		

U: Not Detected, J: Estimated Quantity, X: Outlier for Accuracy or Precision, NR: Not Requested

WATER MATRIX ANALYSES

WATER MATRIX ANALYSES																	
FIELD ID	Metals in Water Results in ug/l					Wet Chemistry Results in mg/l											
	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)	HARDNESS (mg CaCO3/L)
23-501-SW-1	2.7 U	3.8	21.3	17.2	26300	9.6 U	10.9 U	48.2	2000	121 JX	3090	1700 J	0.16 U	13.9 U	0.70 U	2780	78.4
23-501-SW-2	2.7 U	4.9	23.3	12.2	26100	9.6 U	10.9 U	51.3	2190	24.1 JX	2710	1260 J	0.16 U	13.9 U	0.21 UJ	2560	76.4
U: Not Detected; J: Estimated Quantity; X: Outlier for Accuracy or Precision; NR: Not Requested																	

Legend

SE-1: 100 feet below WRT in tributary of Galena Creek.
SE-2: 50 feet above site in tributary of Galena Creek.
WR-1: Composite of WR-1A & WR-1B.
BACKGROUND: From the Tiger Mine (23-055-SS1) (1993 data).
SW-1: Same as SE-1.
SW-2: Same as SE-2.

FIELD ID	Total Dissolved Solids	CHLORIDE	SULFATE	NO3/NO2-N	CYANIDE	
					NR	NR
23-501-SW-1	127	< 5	82	NR	NR	NR
23-501-SW-2	129	< 5	57	NR	NR	NR

U: Not Detected, J: Estimated Quantity, X: Outlier for Accuracy or Precision, NR: Not Requested

Legend

SE-1: 100 feet below WR1 in tributary of Galena Creek.
 SE-2: 50 feet above site in tributary of Galena Creek.
 WR-1: Composite of WR1A & WR1B.
 BACKGROUND: From the Tiger Mine (23-059-SS1) (1993 data).
 SW-1: Same as SE-1.
 SW-2: Same as SE-2.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: May and Edna
Legal Description: T 15N R 9E
Mining District: Hughesville
Latitude: N 47° 05' 25"
Longitude: W 110° 38' 36"
Land Status: Private
Quad: Barker
Inspectors: Tuesday, Flammang, Liebelt
Organization: Pioneer Technical Services, Inc.

County: Judith Basin
Section(s): SW 1/4, NW 1/4, Section 6
Mine Type: Hardrock/Ag, Pb
Primary Drainage: Dry Fork Belt Creek
USGS Code: 10030105
Secondary Drainage: Green Creek/Galena Creek
Date Investigated: September 26, 1995
P.A. # 23-502

- No mill tailings were observed at the site during the investigation.
- The volume of waste rock associated with the site was approximately 2,000 cubic yards. The waste rock was located adjacent to Green Creek and was in contact with surface water when flowing. The following elements were elevated at least three times background:

Arsenic: 71.6 mg/kg	Cadmium: 9.6J mg/kg
Copper: 1,120JX mg/kg	Iron: 135,000 mg/kg
Lead: 1,740 mg/kg	Mercury: 0.41 mg/kg
Zinc: 491 mg/kg	
- There were no discharging adits, shafts, or seeps at the site during the investigation; however, a spring was observed 20 feet south of the waste rock. No samples were collected.
- No other surface water flowed on or near the site except for the spring during the investigation. The next closest surface water source was over 1,000 feet away; no surface water samples were collected.
- Observed releases to Green Creek (sediment) were documented for cadmium, copper, and zinc.
- No potential safety hazards were observed during the investigation.

May & Edna PA# 23-502

SOLID MATRIX ANALYSES

FIELD ID	Sh (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)	CYANIDE (mg/kg)
23-502-SE-1	4.4 UJ	2.0 J	70.2 J	1.0 J	91600	5.1	3.2	4.38 JX	14000	320	35400	677	0.040 U	7.4	0.6 U	156	NR
23-502-SE-2	6.4 UJ	30.4	276 J	7.0 J	27100	3.8	15.4	87.0 JX	20700	383	14800	2950	0.056 U	13.5	4.3	1380	NR
23-502-WR-1	5.0 UJ	71.6	45.1 J	9.6 J	8700	6.5	1.8 U	1120 JX	135000	1740	983	229	0.41	11.6	54.8	491	NR
BACKGROUND	3.98 UJ	5.1 J	159 J	1 U	NR	8.09 J	3.83	9.81 J	13300	61.4	NR	548	0.02772	7.93	NR	130	NR
Acid/Base Accounting																	
	TOTAL SULFUR %	Total Sulfur	Neutral Acid Potent.	Tot. Sulfur	Sulfate Sulfur	Pyritic Sulfur	Organic Sulfur	Pyritic Sulfur	Acid Base Potential	Acid Base Potential	Line Req. Sobek (t/1000t)	Potential Acidity	Line Req. Dolphop (t/1000t)	Line Req. Dolphop (t/acc.) 1ft.			
FIELD ID					%	%	%										
23-502-WR-1	9.27	290	21.2	-268	<0.01	1.07	10.0	33.6	-12.30	-12.30	-25.83	345.94	-405.92	-852.44			

Legend

SE-1- 40 feet upstream of site in Green Creek.
SE-2- 25 feet downstream from site in Green Creek.
WR-1- Composite WR1A, 1B, 1C, 1D.
BACKGROUND- From the Tiger Mine (23-059-SS1) (1993 data).

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Kelley</u>	County: <u>Park</u>
Legal Description: <u>T 3N R 12E</u>	Section(s): <u>SW 1/4, NW 1/4, Section 6</u>
Mining District: <u>Big Timber Canyon</u>	Mine Type: <u>Hardrock/Ag-Pb</u>
Latitude: <u>N 46° 02' 07"</u>	Primary Drainage: <u>Big Timber Creek</u>
Longitude: <u>W 110° 17' 25"</u>	USGS Code: <u>10070002</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Blue Lake</u>
Quad: <u>Crazy Peak</u>	Date Investigated: <u>October 6, 1995</u>
Inspectors: <u>Tuesday, Flammang</u>	P.A. # <u>34-113</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 725 cubic yards. The following elements were elevated at least three times background:

Antimony: 25.2JX mg/kg	Arsenic: 145J mg/kg
Barium: 433 mg/kg	Cadmium: 5.2 mg/kg
Copper: 856J mg/kg	Lead: 2,640J mg/kg
Manganese: 4,660 mg/kg	Mercury: 0.44J mg/kg

- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation, though water was ponded in adit and probably flows at wetter times of the year.

- No surface water flowed on or near the site during the investigation. The nearest surface water was a small lake approximately 100 feet away; no surface water samples were collected.

- The potential safety hazard observed at the site consisted of a partially open adit.

Kelly Mine PA# 34-113
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 10/6/95

SOLID MATRIX ANALYSES																		
Metals in soils Results per dry weight basis																		
FIELD ID	Sb (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Ca (mg/Kg)	Cr (mg/Kg)	Co (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Pb (mg/Kg)	Mg (mg/Kg)	Mn (mg/Kg)	Hg (mg/Kg)	Ni (mg/Kg)	Ag (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)	
34-113-WR-1	25.2 JX	145 J	433	5.2	15300	14.9 J	24.9 J	856 J	52900	2640 J	6980	4680	0.44 J	19.9 JX	22.3	183	NR	
BACKGROUND	7.97 UJ	16.3	79.3 J	0.68 J	NR	45.6	13.5	40.1 J	28500	37.2	NR	612	0.06378	24	NR	99	NR	
U- Not Detected; J- Estimated Quantity; X- Outlier for Accuracy or Precision; NR- Not Requested																		
AcidBase Accounting																		
	TOTAL Sulfur %	Total Sulfur %	Neutral Acid Base Potential	Tot. Sulfur Acid Base Potential	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	Pyritic Sulfur Acid Base Potential	Sulfate Sulfur Acid Base Potential	Lime Req. Sobek (t/1000)	Lime Req. Dolphop (t/1000)	Potential Acidity	Lime Req. Dolphop (t/1000)	Line Req. Dolphop (t/1000)				
34-113-WR-1	0.01	0.31	40.7	40.4	<0.01	0.01	<0.01	0.31	40.40	40.40	84.84	0.31	50.48	106.02				

Legend

WR-1: Composite WR1A, WR1B, WR1C
BACKGROUND- Taken from Poor Man's Emma (49-001-SS) (1993 data).

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Stemwinder (South)</u>	County: <u>Park</u>
Legal Description: <u>T 3N R 11E</u>	Section(s): <u>SE 1/4, SE 1/4, Section 1</u>
Mining District: <u>Big Timber Canyon</u>	Mine Type: <u>Hardrock/Ag-Pb</u>
Latitude: <u>N 46° 01' 50"</u>	Primary Drainage: <u>Big Timber Creek</u>
Longitude: <u>W 110° 17' 32"</u>	USGS Code: <u>10070002</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Blue Lake</u>
Quad: <u>Crazy Peak</u>	Date Investigated: <u>October 6, 1995</u>
Inspectors: <u>Tuesday, Flammang</u>	P.A. # <u>34-500</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 225 cubic yards. The waste rock was located adjacent to an unnamed tributary of Big Timber Creek and adit discharge flowed over and into it. The following elements were elevated at least three times background:

Arsenic: 55.7J mg/kg

Barium: 289 mg/kg

Cadmium: 3.6 mg/kg

Copper: 610J mg/kg

Lead: 6,480J mg/kg

Manganese: 1,940 mg/kg

Mercury: 0.54J mg/kg

- One discharging adit was observed at the site which flowed over and through the waste rock. Chronic aquatic life criteria was exceeded for lead and mercury, while acute aquatic life criteria was exceeded for silver. No MCLs were exceeded, and the pH was 8.54.

- Surface water flowed from an unnamed tributary of Big Timber Creek near the waste rock. The chronic aquatic life criteria was exceeded for lead, copper, and mercury, while the acute aquatic life criteria was exceeded for silver. No MCLs were exceeded.

- An observed release to an unnamed tributary of Granite Lake (sediment) was documented for arsenic, copper, and lead.

- The potential safety hazard consisted of an open adit.

Stemwinder Mine PA# 34-500
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 10/6/95

SOLID MATRIX ANALYSES

Metals in soils Results per dry weight basis																	
FIELD ID	Sb (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Ca (mg/Kg)	Cr (mg/Kg)	Co (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Pb (mg/Kg)	Mg (mg/Kg)	Mn (mg/Kg)	Hg (mg/Kg)	Ni (mg/Kg)	Ag (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
34-500-SE-1	6.6 UJX	22.5 J	276	1.9	5350	21.3 J	17.4 J	80.9 J	21300	755 J	7880	647	0.037 UJ	29.1 JX	0.93 U	61.5	NR
34-500-SE-2	7.5 UJX	6.6 J	140	1.4	3070	24.9 J	12.8 J	13.8 J	14400	21.2 J	6150	312	0.037 UJ	28.7 JX	1.1 U	40.9	NR
34-500-WR-1	5.4 UJX	55.7 J	289	3.6	8380	21.6 J	22.7 J	610 J	34200	6480 J	7750	1940	0.54 J	22.0 JX	17.7	143	NR
BACKGROUND	7.97 UJ	16.3	78.3 J	0.68 J	NR	45.6	13.5	40.1 J	28500	37.2	NR	612	0.06378	24	NR	99	NR
U-Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested																	
Acid/Base Accounting																	
	TOTAL SULFUR %	Total Sulfur	Neutral Potent. equiv	Acid Base equiv	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	Pyritic Sulfur	Acid Base equiv	Lime Req. Sobek equiv	Potential Acidity	Lime Req. Dolphop equiv	Lime Req. Dolphop equiv	Line Req. Res. lb.			
34-500-WR-1	0.21	6.56	17.1	10.6	0.04	0.01	0.16	0.31	16.80	16.80	35.28	6.25	13.56	28.48			

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

WATER MATRIX ANALYSES

Metals in Water Results in ug/l																	
FIELD ID	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)	HARDNESS (mg CaCO ₃ /L)
34-500-SW-1	1.9 U	1.5 U	5.3	0.046 U	6020	8.7 U	8.3 U	2.0 J	19.1 J	1.2	395	3.4 UJ	0.26 JX	16.9 U	0.36 JX	9.1 U	16.7
34-500-SW-2	2.1	1.5 U	4.9	0.046 U	5590	8.7 U	8.3 U	2.7 J	14.2 UJ	0.93 U	382	3.4 UJ	0.19 JX	16.9 U	0.21 UJX	9.1 U	15.5
34-500-AD-1	3.4	1.5 U	3.7	0.046 U	8850	8.7 U	8.3 U	2.4 J	34.4 J	11.9	496	3.4 UJ	0.15 JX	16.9 U	0.69 JX	9.1 U	24.1
Wet Chemistry Results in mg/l																	
	Total Dissolved Solids	CHLORIDE		SULFATE	NO ₃ /NO ₂ -N	CYANIDE											
34-500-SW-1	21	<	5	<	5	NR	NR										
34-500-SW-2	17	<	5	<	5	NR	NR										
34-500-AD-1	37	<	5	<	5	NR	NR										

Legend

SE-1: 50' feet downstream of mine in tributary.
SE-2: 50' feet upstream of mine in tributary.
WR-1: Composite of WR IA & WR IB.
BACKGROUND: Taken from Poor Man's Emma (49-001-SS1) (1993 data).
AD-1: Flowing silt at WR-1.
SW-1: Same as SE-1.
SW-2: Same as SE-2.

U: Not Detected; X: Estimated Quantity; J: Outlier for Accuracy or Precision; NR: Not Requested

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

Legend

SE-1- 50' feet downstream of mine in tributary.
 SE-2- 50' feet upstream of mine in tributary.
 WR-1- Composite of WR1A & WR1B.
 BACKGROUND- Taken from Poor Man/ Emma (49-001-SS1) (1993 data).
 AD-1- Flowing adit at WR-1.
 SW-1- Same as SE-1.
 SW-2- Same as SE-2.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Emma Darling</u>	County: <u>Powell</u>
Legal Description: <u>T 7N R 8W</u>	Section(s): <u>SW 1/4, NE 1/4, Section 2</u>
Mining District: <u>Emery</u>	Mine Type: <u>Hardrock/Pb, Ag</u>
Latitude: <u>N 46° 23' 03"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 112° 34' 12"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Public/Private</u>	Secondary Drainage: <u>Rocker Gulch/Cottonwood Creek</u>
Quad: <u>Baggs Creek</u>	
Inspectors: <u>Tuesday, Flammang</u>	Date Investigated: <u>September 16, 1995</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	P.A. # <u>39-027</u>

- No mill tailings were observed at the site during the investigation.
- The volume of waste rock associated with the site was approximately 10,700 cubic yards. The following elements were elevated at least three times background:

Antimony: 126J mg/kg	Arsenic: 5,140 mg/kg
Cadmium: 44.5 mg/kg	Copper: 239J mg/kg
Lead: 2,230J mg/kg	Mercury: 1.1 mg/kg
Zinc: 2,020J mg/kg	
- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation.
- No surface water flowed on or near the site during the investigation. The nearest surface water was 500 feet away; no surface water samples were collected.
- Potential safety hazards observed included a fenced open shaft, an open pit, and a loadout.

Emma Darling PA# 39-027
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/16/95

SOLID MATRIX ANALYSES

Metals in soils
Results per dry weight basis

FIELD ID	Sb (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Ca (mg/Kg)	Cr (mg/Kg)	Co (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Pb (mg/Kg)	Mg (mg/Kg)	Mn (mg/Kg)	Hg (mg/Kg)	Ni (mg/Kg)	Ag (mg/Kg)	Zn (mg/Kg)	CYANIDE (mg/Kg)
39-027-WR-1	126 J	5140	130	44.5	17800	20.5	25.9	239 J	78500	2230 J	8250	2200	1.1	10.0	101	2020 J	NR
BACKGROUND	7 UJ	91	295	3.5	NR	36.9	13.9	67.3	43400	43	NR	2960	0.165	7	NR	171	NR

U: Not Detected; J: Estimated Quantity; X: Outlier for Accuracy or Precision; NR: Not Requested

Acid/Base Accounting

FIELD ID	Total Sulfur		Tot. Sulfur		Pyritic Sulfur		Pyritic Sulfur		Line Req. Sulfur		Line Req. Sulfur		Line Req. Sulfur		Line Req. Sulfur		Line Req. Sulfur	
	TOTAL SULFUR %	Acid Base %	Neutral Potent. %	Acid Base %	Pyritic Sulfur %	Acid Base %	Pyritic Sulfur %	Acid Base %	Line Req. Sulfur %	Acid Base %	Line Req. Sulfur %	Acid Base %	Line Req. Sulfur %	Acid Base %	Line Req. Sulfur %	Acid Base %	Line Req. Sulfur %	Acid Base %
39-027-WR-1	3.40	106	149	43.0	-0.01	1.63	2.42	50.9	96.30	206.43	126.56	28.05	56.90					

Legend

WR-1: Composite WRIA, 1B, 1C, 2A, 2B, 3A, 3B
BACKGROUND: From the Emery Mine (39-004-SS1) (1993 data)

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Bonanza</u>	County: <u>Powell</u>
Legal Description: T <u>7N</u> R <u>8W</u>	Section(s): <u>NE 1/4, NW 1/4, Section 11</u>
Mining District: <u>Emery</u>	Mine Type: <u>Hardrock/Au, Pb, Ag</u>
Latitude: <u>N 46° 22' 45"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 112° 34' 12"</u>	USGS Code: <u>17010201</u>
Land Status: <u>Private</u>	Secondary Drainage: <u>Rocker Gulch/Cottonwood Creek</u>
Quad: <u>Baggs Creek</u>	Date Investigated: <u>September 16, 1995</u>
Inspectors: <u>Tuesday, Flammang</u>	P.A. # <u>39-501</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 9,300 cubic yards. The following elements were elevated at least three times background:

Arsenic: 8,350 mg/kg	Cadmium: 38 mg/kg
Lead: 4,120J mg/kg	Mercury: 0.69J mg/kg
Zinc: 4,390J mg/kg	

- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation.

- No surface water flowed on or near the site during the investigation. The nearest surface water was over 1,000 feet away; no surface water samples were collected.

- Potential safety hazards observed included an open incline, two buildings, two loadouts, and steep slopes on WR-1.

Bonanza Mine PA# 39-501

SOLID MATRIX ANALYSES

SOLID MATRIX ANALYSES																		
FIELD ID		Metals in soils Results per dry weight basis														CYANIDE (mg/Kg)		
		Sb (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Ca (mg/Kg)	Cr (mg/Kg)	Co (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Pb (mg/Kg)	Mg (mg/Kg)	Mn (mg/Kg)	Hg (mg/Kg)	Ni (mg/Kg)	Ag (mg/Kg)	Zn (mg/Kg)	
39-501-WR-1		13.3 J	8350	17.4	38.0	44200	10.9	14.5	62.6 J	49100	4120 J	17300	4400	0.69	15.8	29.1	4390 J	NR
BACKGROUND		7 UJ	91	295	3.5	NR	36.9	13.9	67.3	43400	43	NR	2960	0.165	7	NR	171	NR
U: Not Detected, J: Estimated Quantity, X: Outlier for Accuracy or Precision, NR: Not Requested																		
Acid/Base Accounting																		
FIELD ID		TOTAL SULFUR %	Total Sulfur U/1000g	Neutral Sulfur U/1000g	Tot. Sulfur Acid Base U/1000g	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	Pyritic Sulfur Acid Base U/1000g	Pyritic Sulfur Acid Base Potential	Lime Req. Sobek (lb./c. 1000)	Lime Req. Dolthoff (lb./c. 1000)	Potential Acidity	Lime Req. Dolthoff (lb./c. 1000)	Lime Req. (lb./c. 1000)			
39-501-WR-1		5.00	156	138	-18.3	-0.01	1.91	3.54	59.7	78.20	78.20	164.22	170.31	-40.39	-84.82			

U.L. Not Detected; J- Estimated Quantity; X- Outlier for Accuracy or Precision; NR- Not Requested

Legend

WR-1-Composite 1A, 1B, 2(1B), 2A, 2C.
BACKGROUNd-From the Emery Mine (39-004-SS1) (1993 data).

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>Hidden Hand</u> Legal Description: T <u>7N</u> R <u>8W</u> Mining District: <u>Emery</u> Latitude: <u>N 46° 23' 28"</u> Longitude: <u>W 112° 33' 31"</u> Land Status: <u>Public</u> Quad: <u>Baggs Creek</u> Inspectors: <u>Tuesday, Flamman</u> Organization: <u>Pioneer Technical Services, Inc.</u>	County: <u>Powell</u> Section(s): <u>NE 1/4, SE 1/4, Section 3</u> Mine Type: <u>Hardrock/Au</u> Primary Drainage: <u>Clark Fork River</u> USGS Code: <u>17010201</u> Secondary Drainage: <u>Baggs Creek/Cottonwood Creek</u> Date Investigated: <u>September 17, 1995</u> P.A. # <u>39-502</u>
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- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 7,700 cubic yards. The waste rock was in direct contact with water from the adit discharge and in an intermittent drainage. The following elements were elevated at least three times background:

Antimony: 24.3J to 22.9J mg/kg	Arsenic: 2,030 to 2,510 mg/kg
Lead: 4,060J to 4,570 mg/kg	Mercury: 0.56 mg/kg
Zinc: 547J mg/kg	

- One discharging adit was observed at the site which flowed over and through WR-4. No acute or chronic aquatic life criteria or MCLs were exceeded. The pH was 7.53.

- Surface water was collected downstream from the adit discharge and WR-4 in a tributary of Baggs Creek. Acute and chronic aquatic life criteria were exceeded for zinc. Chronic aquatic life criteria was exceeded for cadmium, and the MCL for cadmium was exceeded.

- Potential safety hazards observed at the site included four open adits, an open shaft, a partially collapsed cabin, a loadout, and a trench associated with a collapsed adit.

Hidden Hand Mine PA# 39-502
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/17/95

SOLID MATRIX ANALYSES

SOLID MATRIX ANALYSES																	
Results in soils Results per dry weight basis																	
FIELD ID	Sb (mg/Kg)	As (mg/Kg)	Ba (mg/Kg)	Cd (mg/Kg)	Ca (mg/Kg)	Cr (mg/Kg)	Co (mg/Kg)	Cu (mg/Kg)	Fe (mg/Kg)	Pb (mg/Kg)	Mg (mg/Kg)	Mn (mg/Kg)	Hg (mg/Kg)	Ni (mg/Kg)	Ag (mg/Kg)	Zn (mg/Kg)	CVANDE (mg/Kg)
39-502-SE-1	7.4 UJ	40 ¹	225	56.6	6390	76.0	54.7	85.8 J	60800	1060 J	17100	5210	0.061	37.2	2.3	4610 J	NR
39-502-WR-1	22.9 J	2510	81.7	0.55	2620	29.2	3.9	33.7 J	57600	4570 J	7380	257	0.28	4.5	17.5	185 J	NR
39-502-WR-2	24.3 J	2030	107	3.6	11700	35.3	22.8	57.5 J	52400	4060 J	8630	930	0.56	9.0	16.6	547 J	NR
BACKGROUND	7 UJ	91	295	3.5	NR	38.9	13.9	67.3	43400	43	NR	2560	0.165	7	NR	171	NR
U-Not Detected, J-Estimated Quantity, X-Outlier for Accuracy or Precision, NR-Not Requested																	
Acid/Base Accounting																	
FIELD	TOTAL SULFUR		Neutral Acid Base Potential	Tot. Sulfur		Pyritic Sulfur	Organic Sulfur	Pyritic Sulfur	Pyritic Sulfur	Lime Req. Sulfur (lbs/1000)	Lime Req. Sulfur (lbs/1000)	Potential Acidity	Lime Req. Dolphop (lb/ton)	Lime Req. Dolphop (lb/ton)			
	Total	Acid Base		Acid Base													
39-502-WR-1	1.42	44.4	-1.54	46.9	-46.9	0.03	0.62	0.03	0.62	0.03	-4.56	33.68	-44.02	-92.44			
39-502-WR-2	1.43	44.7	0.69	-44.0	-44.0	0.13	0.94	0.13	-0.24	-0.50	34.77	-42.60	-89.46				

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

WATER MATRIX ANALYSES

WATER MATRIX ANALYSES																		
Metals in Water																		
Results in ug/l																		
FIELD ID	Al (ug/L)	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)	HARDNESS (mg CaCO3/L)
39-502-SW-1	259 JX	3.9 J	7.7	12.5	5.9	60200	9.6 U	10.9 U	4.4 U	309	7.4	16500	65.0	0.15 U	13.9 U	0.64	548	218
39-502-AD-1	141 JX	5.8 J	19.8	15.1	1.8	83300	9.6 U	10.9 U	4.4 U	326	0.58 U	21200	845	0.15 U	13.9 U	0.56	111	295
West Chemistry Results in mg/l																		
FIELD ID	Total Solids		CHLORIDE		SULFATE		NO3NO2-N		CYANIDE		Ag (ug/L)		Zn (ug/L)					
	446	< 5	178	NR	170	NR	NR	NR	548	111	0.64	13.9 U	0.56	218				
39-502-AD-1	64	< 5	NR	NR	NR	NR	NR	NR	111	295	0.56	13.9 U	0.56	295				
IL: NR Detected; J: Estimated Quantity; X: Outlier for Accuracy or Precision; NR: Not Requested																		

U- Not Detected, J- Estimated Quantity, X- Outlier for Accuracy or Precision, NR- Not Requested

Legend

SE-1- Tributary of Baga Creek below acid discharge and WRA
 SE-2- Composite of WRA 1A, 1B, 2A, 2B, (upper dumps)
 WR-2- Composite of WRA 3A, 3B, 3C, 4A, 4B, (middle & lower dumps)
 BACKGROUND- From the Emery Mine (39-004-S51) (1993 data)
 AD-1- Adit associated with WR-4.
 SW-1- Same as SE-1.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: Spring Creek Tailings
Legal Description: T 7N R 8W
Mining District: Emery
Latitude: N 46° 22' 05"
Longitude: W 112° 34' 29"
Land Status: Public
Quad: Sugarloaf Mountain
Inspectors: Tuesday, Clark, Liebelt
Organization: Pioneer Technical Services, Inc.

County: Powell
Section(s): NE 1/4, SW 1/4, Section 11
Mine Type: Millsite/Au
Primary Drainage: Clark Fork River
USGS Code: 17010201
Secondary Drainage: North Fork Cottonwood Creek/Spring Creek
Date Investigated: November 13, 1995
P.A. # 39-503

- The volume of tailings associated with the site was approximately 7,700 cubic yards. Surface water from Spring Creek flowed through the tailings. The following elements were elevated at least three times background:

Antimony: 337 to 602 mg/kg	Arsenic: 6,960 to 13,400 mg/kg
Cadmium: 99.2J to 55.2J mg/kg	Copper: 244 to 359 mg/kg
Lead: 4,900J to 5,320J mg/kg	Manganese: 17,400J mg/kg
Zinc: 6,490J to 9,230J mg/kg	
- There were no discharging adits, filled shafts, seeps, or springs observed at the site during the investigation.
- Surface water from Spring Creek flowed through the site. Chronic aquatic life criteria was exceeded for lead. No acute aquatic life criteria were exceeded. The MCL was exceeded for antimony.
- Observed releases to Spring Creek (sediment) were documented for antimony, arsenic, cadmium, copper, lead, manganese, and zinc; the water had documented releases attributable to the site for arsenic, cadmium, lead, and manganese.
- No potential safety hazards were observed at the site during the investigation.

Spring Creek Tailings PA# 39-503
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 9/14/95

SOLID MATRIX ANALYSES																
Metals in solids Results per dry weight basis																
FIELD ID	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)
39-503-SE-1	134	3110 J	93.3	30.9 J	12700	46.2 J	16.3	133	44700 J	1650 J	11200	8250 J	0.14	16.8	218 J	3750 J
39-503-SE-2	8.7 U	114 J	74.6	2.1 J	6090	35.3 J	22.6	39.8	40500 J	62.4 J	15200	760 J	0.046 U	48.6	1.2 U	437 J
39-503-TP1	337	3960 J	63.9	55.2 J	31800	37.0 J	14.3	244	54600 J	4900 J	17900	5750 J	0.40	13.5	60.7 J	6490 J
39-503-TP2	602	13400 J	39.3	99.2 J	26300	16.1 J	11.6	359	57800 J	5320 J	12100	17400 J	0.31	3.2 U	96.3 J	9230 J
BACKGROUND	7 UJ	91	295	3.5	NR	36.9	13.9	67.3	43400	43	NR	2960	0.165	7	NR	171
AcidBase Accounting																
FIELD ID	TOTAL SULFUR		Total Sulfur		Sulfate		Pyritic Sulfur		Pyritic Sulfur		Line Req.		Line Req.		Line Req.	
	%	%	Acid Base	Potent.	Acid Base	Potent.	Acid Base	Potent.	Acid Base	Potent.	Acid Base	Potent.	Acid Base	Potent.	Acid Base	Potent.
39-503-TP1	2.34	73.1	22.2	95.3	<0.01	<0.01	0.46	61.9	33.4	11.3	33.40	70.14	76.25	23.81	50.01	
39-503-TP2	3.72	116	-11.5	105			1.38	93.4			11.30	23.73	136.56	-39.45	-82.85	

U: Not Detected; J: Estimated Quantity; X: Outlier for Accuracy or Precision; NR: Not Requested

WATER MATRIX ANALYSES																
Metals in Water Results in ug/l																
FIELD ID	Sb (ug/l)	As (ug/l)	Ba (ug/l)	Cd (ug/l)	Ca (ug/l)	Cr (ug/l)	Co (ug/l)	Cu (ug/l)	Fe (ug/l)	Pb (ug/l)	Mg (ug/l)	Mn (ug/l)	Hg (ug/l)	Ni (ug/l)	Ag (ug/l)	Zn (ug/l)
39-503-SW-1	10.4 J	50.4	13.4	0.77 J	50300	9.8	8.3 U	2.8 J	190	35.5 J	12500	46.5 J	0.14 U	16.9 U	0.21 U	78.0
39-503-SW-2	3.5 J	7.2	12.3	0.22 J	48900	8.7 U	8.3 U	2.0 U	25.3	0.93 U	12300	5.8 J	0.14 U	16.9 U	0.21 U	34.4
Wet Chemistry Results in mg/l																
FIELD ID	Total Dissolved Solids		CHLORIDE		SULFATE		NO3/NO2-N		CYANIDE		HARDNESS (mg CaCO3/l)					
	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l				
39-503-SW-1	250	< 5	95	NR	NR	NR	NR	NR	NR	NR	NR	NR				
39-503-SW-2	242	< 5	87	NR	NR	NR	NR	NR	NR	NR	NR	NR				

U: Not Detected; J: Estimated Quantity; X: Outlier for Accuracy or Precision; NR: Not Requested

Legend

SE-1: in Spring Creek, 100' downstream from main tailings impoundment.
 SE-2: in Spring Creek, 100' upstream from main tailings impoundment.
 TP1: Composite of subsamples TP1A, TP1B, and TP1C.
 TP2: Composite of subsamples TP1A-2, TP1B-2, and TP1B-3.
 BACKGROUND: From the Energy Mine (30-004-SE-1) (1983 data).
 SW-1: Same as SE-1.
 SW-2: Same as SE-2.

**MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ABANDONED MINE RECLAMATION BUREAU
HAZARDOUS MATERIALS INVENTORY
SITE SUMMARY**

Mine/Site Name: <u>S & H</u>	County: <u>Sanders</u>
Legal Description: <u>T 18N R 26W</u>	Section(s): <u>SE 1/4, SW 1/4, Section 8</u>
Mining District: <u>Plains</u>	Mine Type: <u>Hardrock/Cu, Ag</u>
Latitude: <u>N 47° 19' 35"</u>	Primary Drainage: <u>Clark Fork River</u>
Longitude: <u>W 114° 56' 20"</u>	USGS Code: <u>17010204</u>
Land Status: <u>Public</u>	Secondary Drainage: <u>Clark Fork River</u>
Quad: <u>Keystone Peak</u>	Date Investigated: <u>October 7, 1995</u>
Inspectors: <u>Tuesday, Flammang</u>	P.A. # <u>45-017</u>
Organization: <u>Pioneer Technical Services, Inc.</u>	

- No mill tailings were observed at the site during the investigation.

- The volume of waste rock associated with the site was approximately 75 cubic yards. The waste rock was located adjacent to flow from the adit discharge. The following elements were elevated at least three times background:

Copper: 622J mg/kg	Iron: 15,400 mg/kg
Lead: 99.4J mg/kg	Mercury: 0.23J mg/kg
Barium: 51.7 mg/kg	

- One discharging adit was observed at the site which flowed adjacent to the waste rock and into the Clark Fork River. The chronic aquatic life criteria was exceeded for mercury. No acute aquatic life criteria or MCLs were exceeded. The pH was 7.15.

- Surface water flow from the Clark Fork River was near the site. However, no samples were collected due to the large volume of water in the river with respect to the negligible amount contributed from the site.

- Potential safety hazards observed at the site included an adit opening and a highwall above the adit opening.

S & H PA# 45-017
AMRB HAZARDOUS MATERIALS INVENTORY
INVESTIGATOR: PIONEER-TUESDAY
INVESTIGATION DATE: 10/7/95

SOLID MATRIX ANALYSES

SOLID MATRIX ANALYSES																	
FIELD ID	Metals in soils Results per dry weight basis										CYANIDE (mg/kg)						
	Sb (mg/kg)	As (mg/kg)	Ba (mg/kg)	Cd (mg/kg)	Ca (mg/kg)	Cr (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Pb (mg/kg)	Mg (mg/kg)	Mn (mg/kg)	Hg (mg/kg)	Ni (mg/kg)	Ag (mg/kg)	Zn (mg/kg)	
45-017-WR-1	4.1 U/X	14.1 J	51.7	0.43 U	208	2.4 J	1.4 U	622 J	15400	99.4 J	1820	30.4	0.23 J	5.8 JX	1.6	16.2	NR
BACKGROUND	5.39 U	7.89	8.8	0.5 U	NR	1.2 U	3.31	2.44 J	3120	7.59 J	NR	609	0.0065 UJ	2.22 U	NR	11.9	NR
U- Not Detected; J- Estimated Quantity; X- Outlier for Accuracy or Precision; NR- Not Requested																	
FIELD ID	AcidBase Accounting										Line Req. Dollhopf (Res.) 1ft.						
	TOTAL SULFUR %	Total Sulfur Acid Base Potential U/1000g	Neutral Potent. U/1000g	Tot. Sulfur Acid Base Potential U/1000g	Sulfate Sulfur %	Pyritic Sulfur %	Organic Sulfur %	Pyritic Sulfur U/1000g	Acid Base Potential U/1000g	Sulfur Acid Base Potential U/1000g	Line Req. Sobek (Res.) 1ft.	Potential Acidity	Line Req. Dollhopf (U/1000g)	Line Req. Dollhopf (Res.) 1ft.			
45-017-WR-1	0.44	13.7	0.92	-12.8	0.05	0.01	0.38	0.31	0.61	0.61	1.28	13.36	-15.55	-32.65			

WATER MATRIX ANALYSES

WATER MATRIX ANALYSES																	
Metals in Water Results in ug/l		HARDNESS (mg CaCO3/L)															
FIELD ID	Sb (ug/L)	As (ug/L)	Ba (ug/L)	Cd (ug/L)	Ca (ug/L)	Cr (ug/L)	Co (ug/L)	Cu (ug/L)	Fe (ug/L)	Pb (ug/L)	Mg (ug/L)	Mn (ug/L)	Hg (ug/L)	Ni (ug/L)	Ag (ug/L)	Zn (ug/L)	HARDNESS (mg CaCO3/L)
45-017-AD-1	3.2	1.5 U	111	0.046 U	23000	8.7 U	8.3 U	7.2 J	19.1 J	0.93 U	6220	4.5 J	0.23 JX	16.9 U	0.99 JX	21.5	83.1
U- Not Detected; J- Estimated Quantity; X- Outlier for Accuracy or Precision; NR- Not Requested																	

Wet Chemistry
Results in mg/l

FIELD ID	Total Dissolved Solids	CHLORIDE	SULFATE	NO3/NO2/N	CYANIDE
45-017-AD-1	114	< 5	16.0	NR	NR

Legend

WR-1: Composite of WR1A, 1B, BACKGROUND- Taken from Nancy Lee Mine (31-001-SS1) (1993 data).
AD-1: Adit discharge near WR-1.

6.0 REFERENCES

- MBMG, 1994. Montana Bureau of Mines and Geology, Well Logs Database, July 14, 1994.
- MDEQ/AMRB-Pioneer, 1995. Montana Department of Environmental Quality/Abandoned Mine Reclamation Bureau, Abandoned Hardrock Mine Priority Sites, 1995 Summary Report, Prepared by Pioneer Technical Services, Inc., April 1995.
- MDEQ/AMRB-Pioneer, 1994a. Montana Department of Environmental Quality/Abandoned Mine Reclamation Bureau, Sampling and Analysis Plan for the Abandoned Mines Hazardous Materials Inventory, Prepared by Pioneer Technical Services, Inc., May 1994.
- MDEQ/AMRB-Pioneer, 1994b. Montana Department of Environmental Quality/Abandoned Mine Reclamation Bureau, Quality Assurance Project Plan for the Abandoned Mines Hazardous Materials Inventory, Prepared by Pioneer Technical Services, Inc., May 1994.
- MDEQ/AMRB-Pioneer, 1994c. Montana Department of Environmental Quality/Abandoned Mine Reclamation Bureau, Laboratory Analytical Protocol for the Abandoned Mines Hazardous Materials Inventory, Prepared by Pioneer Technical Services, Inc., May 1994.
- MDEQ/AMRB-Pioneer, 1994d. Montana Department of Environmental Quality/Abandoned Mine Reclamation Bureau, Health and Safety Plan for the Abandoned Mines Hazardous Materials Inventory, Prepared by Pioneer Technical Services, Inc., May 1994.
- MDEQ/AMRB-Pioneer, 1994e. Montana Department of Environmental Quality/Abandoned Mine Reclamation Bureau, Abandoned Hardrock Mines Project Report for the Abandoned Hardrock Mine Priority Sites, Prepared by Pioneer Technical Services, Inc., December 1994.
- MDEQ/WQB, 1995. Montana Department of Environmental Quality/Water Quality Bureau, Circular WQB-7, Montana Numeric Water Quality Standards, July 15, 1995.
- MDFWP, 1989. Montana Department of Fish, Wildlife and Parks, Montana Rivers Information System Rivers Report, Version 2.0, Prepared by Montana Natural Resource Information System, December 1989.

GLOSSARY

Abandoned Mine; Abandoned Workings - Excavations, either open, caved, or sealed, that are deserted and in which further mining is not intended.

Acid Mine Water - Mine water which contains sulfuric acid, mainly due to the oxidation of iron pyrite.

Acidity - Estimate of the capacity for a neutral water to neutralize caustic wastes without disturbing biological activities.

Activator (floatation mill) - A reagent that facilitates floatation of selected mineral species in a floatation cell.

Acute Aquatic Life Criteria - EPA's maximum acute toxicity concentrations for protection of aquatic life and its uses as established under Section 304(a)(1) of the Clean Water Act, as amended.

Adit - A horizontal or nearly horizontal passage driven in rock from the surface of the working or dewatering of a mine.

Alkalinity - Estimate of the capacity for a neutral water to neutralize acidic wastes without disturbing biological activities.

Alluvium - Sediments deposited on land by streams and rivers.

AIMSS - Abandoned and Inactive Mines Scoring System.

Amalgamation - The process by which mercury is alloyed with some other metal to produce an amalgam. Used at one time for the extraction of gold and silver from pulverized ores.

Attribution - To document an observed release of a hazardous substance(s) to the environment, the presence of the hazardous substance(s) must be attributable to a waste source at the site. For example, if an observed release to surface water can be established for copper, the concentration of copper in any waste source at the site must exist at greater than three times the background concentration of copper to establish attribution to the site.

Ball Mill - A rotating horizontal cylinder in which nonmetallic materials are ground using various types of grinding media such as quartz pebbles, porcelain balls, or steel balls.

Barren Solution - Leaching solution that has been chemically stripped of metal values. Typically, the barren solution is recharged with leaching agent and recycled.

Benefication - The processing of ores for the purpose of (1) regulating the size of a desired product, (2) removing unwanted constituents, and (3) improving the quality, purity, or assay grade of a desired product.

BLM - United States Department of Interior, Bureau of Land Management.

Bore Hole - An exploratory or prospecting hole made by drilling.

CECRA - The Comprehensive Environmental Cleanup and Responsibility Act.

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, also known as Superfund: Amended in 1986 by the Superfund Amendments and Reauthorization Act (SARA).

Chronic Aquatic Life Criteria - EPA's maximum chronic toxicity concentrations for protection of aquatic life and its uses as established under Section 304(a)(1) of the Clean Water Act, as amended.

Claim - An area of land claimed by an individual or corporation for the ultimate purpose of mineral extraction. The dimensions of a lode claim are 600 by 1,500 feet; for a placer claim, 600 by 1,320 feet.

Collar - The term applied to the timbering or concrete around the mouth or top of a shaft. The junction of a mine shaft with the surface.

Collector (floatation mill) - A reagent that aids or facilitates the attraction of mineral particles to the froth in a floatation cell.

Comminution - To reduce solids to minute particles by crushing and grinding to liberate metals.

Concentrate - To separate metal or ore from the associated gangue or barren rock.

Concentrate (mineral concentrate) - Enriched ore after the removal of waste in a beneficiation mill.

Concentrator - Mill or plant in which ore is concentrated by removing unwanted constituents.

Containment - Engineered structures designed to prevent releases to groundwater, such as liners, covers, and run-on diversions.

Country Rock - General term applied to the rock surrounding and penetrated by mineralized veins; in a wider sense applied to the rocks invaded by and surrounding an igneous intrusion.

Cribbing - A method of timbering used primarily to rectify the removal of too great a percentage of the rock on the advance, and has the effect of replacing part of the rock.

Crosscut - (1) A passageway driven at right angles to the main entry to connect it with a parallel entry of air course. (2) A horizontal opening driven across the course of a vein or in general perpendicular to the direction of the main workings.

Crusher - A machine for crushing rock or other materials. Among the various types of crushers are the ball-mill, gyratory crusher, Hadsel mill, jaw crusher, rod mill, rolls, stamp mill, and tube mill.

Cyanide - A salt or ester of hydrocyanic acid. In aqueous solution, cyanide is used to dissolve metal from gangue material for later recovery.

Cyclone - A device for classification by centrifugal means of fine particles suspended in water, whereby the coarser grains collect and are discharged at the apex of the vessel, while the finer particles are eliminated with the bulk of the water at the discharge orifice.

Depressant (floatation mill) - A reagent that causes selected mineral species to sink in a floatation cell.

DNRC - Montana Department of Natural Resources and Conservation.

Drainage Basin Code - Code assigned to each discrete hydrologic unit by the U.S. Geological Survey.

Drift - A horizontal passage underground. A drift follows the vein, as distinguished from a crosscut, which intersects it.

Dump - A pile or heap of waste rock material or other non-ore refuse near a mine.

Electrowinning - Recovery of a metal from an ore or solution by electrochemical processes.

EPA - United States Environmental Protection Agency.

Face - The surface exposed by excavation. The working face, front, or forehead is the face at the end of the tunnel heading, or at the end of the full size excavation.

Floatation - The method of mineral separation which a froth created in water by a variety of reagents floats some finely crushed minerals, whereas other mineral sink.

Floatation Cell - Device in which froth floatation of ores is performed. It has provisions for receiving conditioned pulp, aerating the pulp, and for separate discharge of the resulting mineralized froth and impoverished tailings.

Floodplain - An alluvial plain caused by the overbank deposition of alluvial material. They typically appear as flat expanses of land bordering a stream or river. Most floodplains are accompanied by a series of alluvial terraces of varying levels.

Fluvial - Pertaining to or produced by the action of a stream or river.

Frother - A reagent which serves to stabilize the froth in a floatation cell until it can be scraped off into the concentrate launder.

Glory Hole - Large, open hole typically associated with a mined-out or widened shaft.

Gravity Mill - A process in which heavy metals or minerals are separated from waste by the action of agitation and gravity on materials suspended in a liquid, usually water.

Grizzly - A device used for coarse screening of bulk materials. A rugged screen for rough sizing at a comparatively large size (for example, 6-inches); it can comprise fixed or moving bars, disks, or shaped tumblers or rollers.

Hand Auger - A large tool modeled after the carpenter's drill used in soil sampling.

HRS - EPA's Hazard Ranking System (Federal Register, Vol. 55, No. 241, pp. 51532-51667).

Hazardous Substance - CERCLA hazardous substances, pollutants, and contaminants as defined in CERCLA Sections 101(14) and 101(33).

Headframe - The vertical steel or timber frame at the top of a shaft, which carries the sheave or pulley for the hoist.

Heavy Metal - Principally the metals zinc, copper, cobalt, and lead; however, may include one or more of the following metals: bismuth, cadmium, gold, indium, iron, manganese, mercury, nickel, palladium, silver, thallium, and tin (often included, though not a metal).

Highwall - The unexcavated face of exposed overburden and coal or ore in an open-cast mine or the face or bank on the uphill side of contour strip mine excavation.

Hoist - (1) A drum on which wire rope is wound in the engine house, as the cage or skip is raised in the hoisting shaft. (2) An engine with a drum used for winding up a load from a shaft.

Inclined Shaft or Incline - A non-vertical shaft; usually along the dip of a vein.

Intermittent Stream - A stream or stretch of stream which flows only at certain times of the year when it receives water from springs, snow melt or storm runoff.

Jaw Crusher - A primary crusher designed to reduce large rocks or ores to sizes capable of being handled by a secondary crusher. It consists of a moving jaw, hinged at one end, which swings toward and away from a stationary jaw in a regular oscillatory cycle.

Jig (Mineral Jig) - A machine in which the feed is stratified in water by means of a pulsating motion and from which the stratified products are separately removed, the pulsating motion usually being obtained by alternate upward and downward currents of water.

Latitude - The angular distance north or south from the equator of a point on the earth's surface, expressed in degrees.

Leaching - (1) The removal in solution of the more soluble minerals by percolating waters. (2) Extracting a soluble metallic compound from an ore by selectively dissolving it in a suitable solvent, such as water, sulfuric acid, hydrochloric acid, cyanide, etc.

Legal Description - The Township, Range, Section, and typically quarter/quarter section location.

Level - A main underground roadway or passage driven along the level course to afford access to the stopes or workings and to provide ventilation and haulageways for the removal of ore.

Loadout - A receptacle for ore awaiting treatment or shipment, also referred to as an ore bin.

Longitude - An angular distance east or west from the meridian of some particular place to the prime meridian at Greenwich, England.

MCL - Maximum contaminant level: Established under the Safe Drinking Water Act.

MCLG - Maximum contaminant level goal: Established under the Safe Drinking Water Act.

Master Inventory - Inventory of all identifiable abandoned or inactive hardrock mine sites in Montana conducted by the MDEQ/AMRB.

Mesh - The number of openings per unit area of a screen (sieve).

Mill - A mineral treatment plant in which crushing, grinding, and further processing of ore is conducted to produce a product.

Milling - The processing of ore to produce a product.

Mine - Excavation of earth for the extraction of ore or other economic minerals.

Mine Development - The term used to describe the operations involved in preparing a mine for ore extraction. These operations may include tunneling, sinking, crosscutting, drifting, and raising.

Mineral - An inorganic substance occurring in nature, though not necessarily of inorganic origin, which has (1) a definite chemical composition or, more commonly, a characteristic range of composition, and (2) distinctive physical properties or molecular structure.

Mineral Deposit - A surface or underground body of mineral matter that may be utilized for its industrial mineral or metal content.

Mineral Dressing - Physical and chemical concentration of raw ore into a product from which a metal can be recovered for a profit.

MBMG - Montana Bureau of Mines and Geology.

MDEQ/AMRB - Montana Department of Environmental Quality/Abandoned Mine Reclamation Bureau.

MDEQ/ERD - Montana Department of Environmental Quality/Environmental Remediation Division.

MDEQ/WQB - Montana Department of Environmental Quality/Water Quality Bureau.

Observed Release - Concentration of hazardous substance(s) has increased significantly (greater than three times) above the background concentration for the site for that specific type of sample. For example, to document an observed release to surface water, a contaminant concentration detected in a surface water sample collected downstream from a site must exceed the concentration detected in a surface water sample collected upstream from the site by more than three times. See also "Attribution".

Open Pit Mining - A form of operation designed to extract minerals that lie near the surface.

Open Stope Method - Stopping in which no regular artificial method of support is employed, although occasional props or cribs may be used to hold local patches of insecure ground. Usually confined to relatively small, narrow ore bodies.

Ore - A mineral, or mineral aggregate, containing precious or useful metals, and which occurs in such quantity, grade, and chemical combination as to make extraction commercially profitable.

Ore Bin - A receptacle for ore awaiting treatment or shipment, also referred to as a loadout.

Ore Body - A solid and fairly continuous mass of ore, which may include low-grade ore and waste, as well as high-grade material.

Ore Deposit - A general term applied to rocks containing minerals of economic value in such amount that they can be profitably tractured.

Oxidation/Reduction Potential - The hypothetical electron activity at equilibrium. A measurement of the relative tendency (potential) of a solution to accept or transfer electrons, measured in volts.

Perennial Stream - A stream or stretch of a stream that flows continuously throughout the year.

pH - A measure of the degree of acidity or basicity of a solution. At 25°C, a pH of 7 is neutral. Acidity increases as measurements decrease below 7, and basicity increases as measurements increase above 7.

Placer - A mineral concentration resulting from weathering processes, usually involving water. Placer deposits are typically composed of heavy minerals, with gold, platinum, tin, and diamonds being the most important.

Ponded - A condition in which free water covers the soil surface, as in a closed depression.

Portal - (1) The surface entrance to a drift, tunnel, or adit; (2) The entrance to a mine.

PRP - Potentially Responsible Party.

Pregnant Solution - Metal-laden solution (cyanide, acid, etc.) resulting from a leach process.

Primary Drainage - The primary drainage is the smallest named stream segment/drainage basin that is locatable on the USGS Hydrologic Unit Map within which the mine site is located.

PA No. - Problem Area Number established by the MDEQ/AMRB.

Prospect - (1) A mineral property, the value of which has not been proved by exploration. (2) Non-producing mining property under development or considered worthy of such attention.

Pulp - A mixture of ground ore and water capable of flowing through suitably graded channels as a fluid.

QA/QC - Quality Assurance/Quality Control.

Raise - A vertical or inclined opening driven upward from a level to connect with the level above, or to explore the ground for a limited distance above one level.

Reagent - A chemical or solution used to produce a desired chemical reaction; a substance used in assay or floatation.

Rod Mill - A mill for fine grinding, employing long steel rods to grind the material.

Secondary Drainage - The secondary drainage is the smallest named stream segment/drainage that is locatable on the USGS Quadrangle Map within which the mine site is located.

Sediment - Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, or ice and has come to rest on the earth's surface either above or below the water level.

Sedimentation - The settling of solid particles of soil, coal, or mineral from liquid as a result of gravity or centrifuging.

Shaft - An excavation of limited area compared with its depth, made for access to underground mine workings.

Sluice (Sluice Box) - A long trough-like box set at an incline of about 1:20 through which placer gravel is carried by a stream of water. The gravel is washed away while most of the gold or other heavy materials are caught by riffles or blankets on the floor of the sluice.

Slurry - Fine solid particles suspended in a liquid, typically water, of a consistency that allows flow by gravity or pumping.

Source - Any area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that have become contaminated from migration of a hazardous substance.

Specific Conductance - The specific conductance or conductivity of water (or other substance measured) is the electrical conductance of the material between opposite sides of a cube 1 centimeter in each direction.

Stamp Mill - An apparatus in which rock is crushed by a stamp battery.

Stope - An underground excavation from which ore has been removed.

Subsidence - A sinking down of a part of the earth's surface due to the collapse of underlying underground openings.

Surface Mining - The mining in surface excavations, including placer mining, mining in open pits, mining and removing ore from open cuts by hand or with mechanical excavating and transportation equipment, and the removal of overburden to uncover the ore.

Tailings - The refuse material resulting from the washing, concentration, or treatment of ground ore.

Tailings Pond - A pond with a constraining wall or dam to which mill effluents are run.

Tunnel - A horizontal or nearly horizontal underground passage that is open to the atmosphere at both ends.

USFS - United States Department of Agriculture, Forest Service.

USGS - United States Department of Interior, Geological Survey.

Waste - The rock that is too low in grade to be of economic value.

Waste Dump (Spoil Pile) - The area where mine wastes or spoil materials are discarded.

Wetlands - Areas that under normal circumstances have hydrophytic vegetation, hydric marshes, and wetland hydrology. It includes landscape units such as bogs, marshes, and lowlands covered with shallow ephemeral or intermittent waters. Permanent waters of streams and water deeper than 9 feet in lakes or reservoirs are not considered wetlands.

Winze - A vertical or inclined opening, or excavation, connecting two levels in a mine, differing from a raise only in construction. A winze is driven downward and a raise is excavated upward.

X-ray Fluorescence (XRF) Spectrometer - Instrument used for metals analysis of solid media by energy dispersive X-ray fluorescence.

